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TECTONICS OF PART OF THE CUMBERLAND PLATEAU: DATA FROM DETAILED GEOLOGIC MAPPING AND SUBSURFACE MAPPING OF STRATIGRAPHIC HORIZONS IN OIL AND GAS WELLS

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To the Graduate Council:

I am submitting herewith a thesis written by Paul Levader Scruggs entitled "TECTONICS OF PART OF THE CUMBERLAND PLATEAU: DATA FROM DETAILED GEOLOGIC MAPPING AND SUBSURFACE MAPPING OF STRATIGRAPHIC HORIZONS IN OIL AND GAS WELLS." I have examined the final electronic copy of this thesis for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Master of Science, with a major in Geology.

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TECTONICS OF PART OF THE CUMBERLAND PLATEAU: DATA FROM DETAILED GEOLOGIC MAPPING AND SUBSURFACE MAPPING OF STRATIGRAPHIC HORIZONS IN OIL AND GAS WELLS

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ABSTRACT

The Cumberland Plateau is located between the Cincinnati arch to the west and the Valley and Ridge foreland fold-thrust belt to the east, and consists of three structural provinces: (1) the mostly undeformed Plateau where the primary structure is a regional dip of ~25 ft/mile (5 m/km) to the southeast off the Cincinnati arch/Nashville dome; (2) the Pine Mountain thrust sheet; and (3) the Cumberland Plateau overthrust sheet that includes the Sequatchie anticline.

Detailed geologic mapping of Fox Creek, Hebbertsburg, and Lancing 7.5-minute quadrangles reveals the Cumberland Plateau overthrust to be a complex series of thrusts and tear faults, bounded to the northeast by the Emory River dextral tear fault. The difference in outcrop pattern of the Cumberland Plateau overthrust and the Pine Mountain thrust has been attributed to changes in stratigraphy and the mechanical strength of the Chattanooga Shale. The relationship between the Sequatchie Valley fault and Cumberland Plateau overthrust has been illustrated through field relationships and in cross sections in the three quadrangles.

Subsurface mapping of several key stratigraphic horizons demonstrates the relationship of subsurface structure to surface geology and the location of upper Fort Payne carbonate mounds on the northern Cumberland Plateau in Anderson, Cumberland, Fentress, Morgan, and Scott Counties, Tennessee. The Middle Ordovician Deicke bentonite, the Mississisippian-Devonian Chattanooga Shale, and the Fort Payne Formation were identified in well logs and interpolated using empirical Bayesian kriging, a geostatistical technique, and analyzed by creating trend surface residual anomaly maps.

Carbonate mounds in the upper Fort Payne Formation of the northern Cumberland Plateau have been of economic interest to the hydrocarbon industry for over 50 years, and subsurface mapping shows that these carbonate mounds are located in a structurally unique setting. Trend surface residual anomaly mapping reveals that the mounds are located: (1) along the crest of a broad NE-SW-striking anticline; (2) in a structurally low area relative to the remainder of the anticline; (3) above small-scale, along-strike anticlines on the Chattanooga Shale surface; and (4) in the Fort Payne Formation where it drastically decreases thickness.

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CHAPTER I

INTRODUCTION

Present study

This study involved two separate, yet interrelated, projects. One focused on understanding the distribution of a specific lithofacies in the Mississippian Fort Payne Formation; the other project consisted of detailed geologic mapping of three 7.5-minute quadrangles on the Cumberland Plateau in Morgan and Cumberland Counties, Tennessee (Fig. 1-1). The goal of these projects was to elucidate the influence of the Acadian and Alleghanian orogenies in the Cumberland Plateau—part of the Appalachian basin. The subsurface portion of the study focused on currently unnamed upper Fort Payne bryozoan carbonate mound facies (Lieber, 1978; Sciple, 1981; MacQuown and Perkins, 1982) in Anderson, Cumberland, Fentress, Morgan, and Scott Counties.

The purpose of the geologic mapping component of this study was to create detailed geologic maps of the Fox Creek, Hebbertsburg, and Lancing 7.5-minute quadrangles at 1:24,000 scale for the Obed Wild and Scenic River, National Park. The most important features in this field area are the Cumberland Plateau overthrust, the northern terminus of the Sequatchie anticline, and the undisturbed Wartburg basin. All of the rocks at the surface in the three quadrangles were deposited during the lower Pennsylvanian (Pottsville) (Greb et al., 2009).

Cumberland Plateau

The Cumberland Plateau extends southwestward from northern Kentucky across east-central Tennessee into Alabama, and is a topographically high physiographic province of generally undeformed, gently dipping Pennsylvanian rocks (Stearns, 1955). It is bounded on the east by the Valley and Ridge province and on the west by the eastern Highland Rim (Hardeman, 1966).

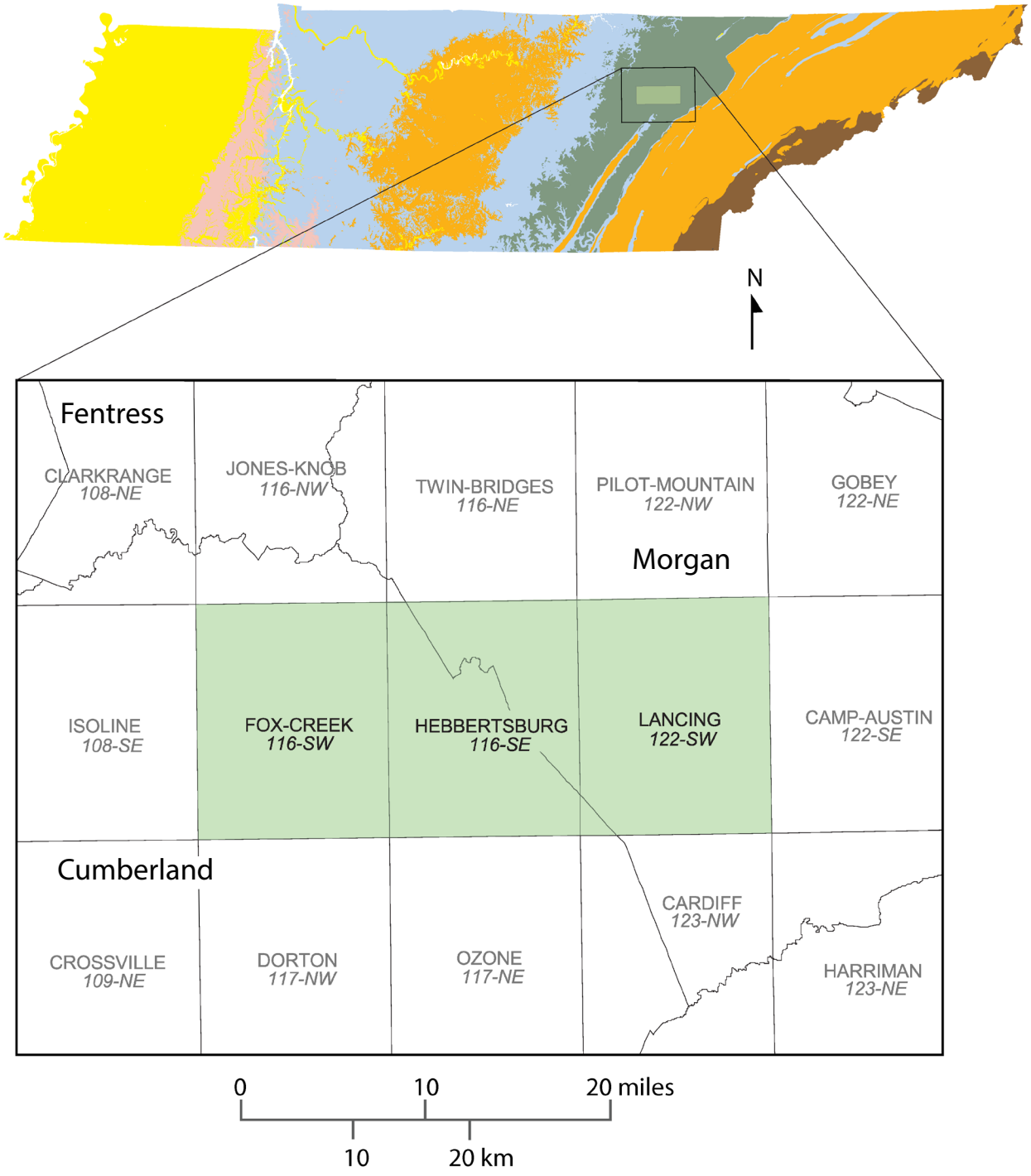


Figure 1-1. Field area for detailed geologic mapping on the Cumberland Plateau in light green. Simplified geologic map of Tennessee at top. Brown: Precambrian. Orange: Cambrian-Ordovician. Light blue: Silurian-Mississippian. Green: Pennsylvanian. Pink: Cretaceous. Yellow: Tertiary-Quaternary (Tennessee Division of Geology).

Purpose

The primary objective is to gain a better understanding of the uplift history of the Nashville dome and western margin of the Appalachian basin as it responded to the tectonic effects of the Acadian/Neoacadian and Alleghanian orogenies. Influence of pre-Chattanooga structural control has been considered, and will be investigated as a possible influence on mound location. Defining controls of the deposition of Early Carboniferous mud mounds is important, because these features are widespread in the middle to late Paleozoic (James and Wood, 2010), and their deposition may have tectonic controls. Since the Fort Payne carbonate mounds have a history of oil production and have not been adequately explored in the subsurface of the Cumberland Plateau, a regional subsurface map along with interpretations related to the control of deposition and trends of these buildups would be valuable from an oil production standpoint.

Geologic field mapping of the Lancing, Hebbertsburg, and Fox Creek 7.5-minute quadrangles will result in the first published 1:24,000-scale maps for these quads. This detailed mapping will also provide greater insight into the structure of the Cumberland Plateau overthrust, as well as its relation to the Sequatchie anticline and the largely undisturbed Wartburg basin. My new structural data will aid in correlation of surface expressions of features recognized in subsurface data. Furthermore, the structural and well log data were used to create four cross sections projected to basement, and the resulting cross sections incorporate the highest degree of control to date.

Study area

The goal of this thesis is to develop a regional sense of the structural and tectonic controls of carbonate mound development in north-central and East Tennessee, as well as to map deformation along the Cumberland Plateau overthrust. The Cumberland Plateau north of the Sequatchie Valley in Tennessee is the main study area for both the subsurface and field components of this study. The subsurface Fort Payne lithofacies was examined in Anderson,

Cumberland, Fentress, Morgan, and Scott Counties, and field mapping was conducted in Cumberland and Morgan Counties.

Geologic setting

The middle Devonian to lower Mississippian Chattanooga Shale (Milici et al., 1979) and the lower to middle Mississippian (Wolak et al., 2015) Fort Payne Formation mark the beginning of a sedimentation cycle of the Paleozoic following immediately following the Neoacadian orogeny in the central and southern Appalachians. This was followed by a Mississippian carbonate sequence and then by Pennsylvanian siliciclastic rock derived from the Alleghanian orogeny (Hatcher et al., 2007a; Ettensohn, 2009; Greb et al., 2009). Deposition of the Chattanooga Shale and equivalent units on folded and faulted rock units of Ordovician to Silurian age (Fig. 1-2), along with the eastwardly increasing clastic nature of the overlying carbonate rocks, are used as evidence for a middle to late Paleozoic Neoacadian orogeny caused by the docking of the Peri-Gondwanan Carolina superterrane (Hatcher et al., 2007a).

The most recent, and most pervasive, tectonic event to affect the southern and central Appalachians is the late Mississippian-early Permian Alleghanian orogeny (Hatcher et al.,

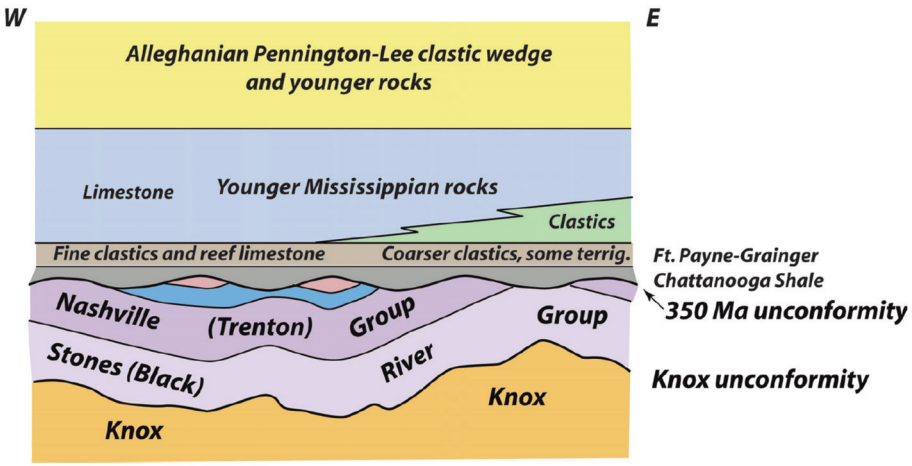


Figure 1-2. Cambro-Ordovician through Pennsylvanian cartoon depicting pre-Chattanooga Shale unconformity. (From Hatcher et al., 2007, their Fig. 13.)

2007a; Hatcher, 2010). This event resulted in the amalgamation of Pangea from the collision of Gondwana with crust accreted during the early to middle Paleozoic orogenies that emplaced the Blue Ridge-Piedmont megathrust sheet indenter that drove foreland deformation in front of and beneath it (Hatcher et al., 2007a; Hatcher, 2010). The Alleghanian orogeny created the Appalachian foreland fold-thrust belt in the Valley and Ridge province and Plateau (Fig. 1-3), which contains a wedge-shaped stack of mostly west-vergent, thin-skinned thrusts in Cambrian to Pennsylvanian age rocks over undeformed Mesoproterozoic basement (Hatcher et al., 2007a). Most of the major thrusts of this province propagated from a basal detachment in the Lower Cambrian Rome Formation, and produced the brittle deformation in the Cumberland Plateau. (Milici, 1963; Rodgers, 1970; Mitra, 1988). The Pine Mountain thrust, Cumberland Plateau overthrust, and Sequatchie Valley fault are expressed at the surface in the Cumberland Plateau and represent the westernmost map-scale Alleghanian deformation at this latitude; all three

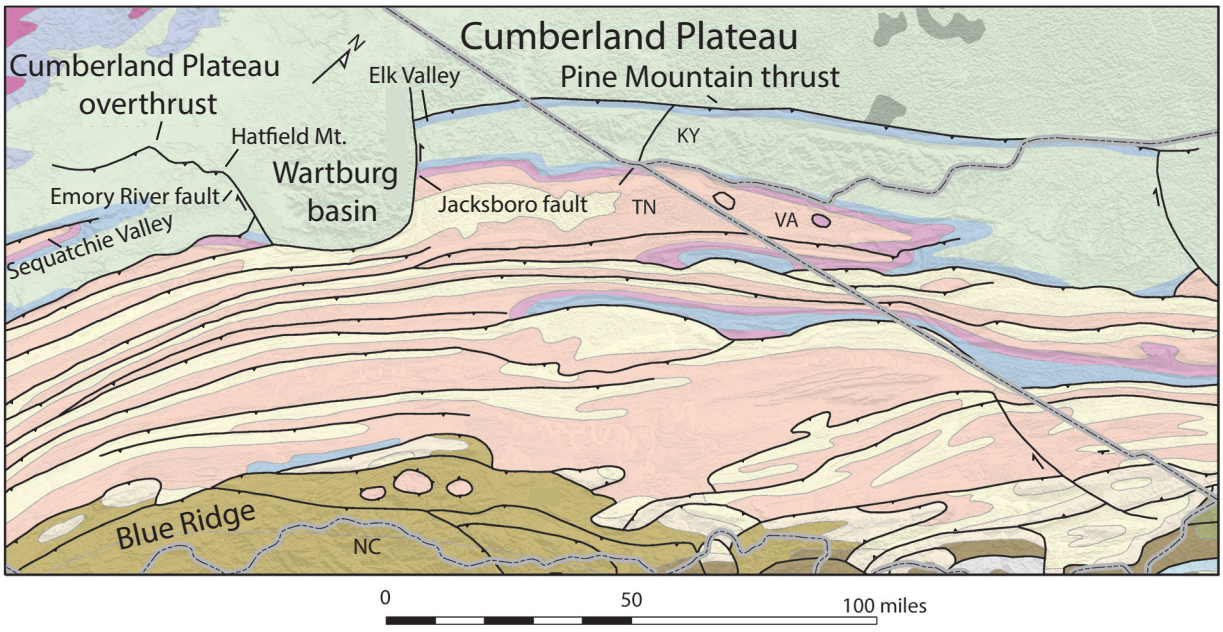


Figure 1-3. Valley and Ridge, Cumberland Plateau, and a limited portion of Blue Ridge provinces. Orange and yellow colors are Cambrian-Ordovician Valley and Ridge units. Light blue is Devonian-Mississippian and purple is Silurian. Green represents Pennsylvanian units. Greenish-brown to southeast is Neoproterozoic.

features are rooted in the Cambrian Rome Formation of the Valley and Ridge (Milici, 1963; Harris and Milici, 1977; Mitra, 1988).

Fort Payne carbonate mound overview

The Late Devonian (Frasnian-Famennian) mass extinction event is known as one of the "big five" mass extinction events in the Phanerozoic. This event influenced many shallow warm water taxa and most of the reef taxa including stromatoporoids, tabulate corals, and complex foraminifera (Hallam and Wignall, 1999). As a result, framework reefs virtually disappeared from the stratigraphic record during the early Mississippian, leading to a period that was dominated by carbonate mud mounds.

Bridges et al. (1995) identified five types of carbonate buildups from the Lower Carboniferous organized from deeper to shallower water: (1) fenestrate bryozoan-sponge spicule buildups; (2) crinoid-bryozoan buildups; (3) crinoid-brachiopod-fenestrate bryozoan buildups; (4) coralgal-*Aphralysia* and bryozoan-coralgal buildups; and (5) trepostome-microthrombolite buildups. To the west of the study area, carbonate mounds are present in the lowermost Fort Payne Formation, just above the Chattanooga Shale (Fig. 1-4). These mounds are present in the subsurface in Clay, Fentress, and Overton Counties and are also exposed in several localities including along Tennessee State Highway 52 in Clay County near Celina, Tennessee. This lower mound facies is known informally as the Beaver Creek sands (Munn, 1914), and have a significantly less prolific oil and gas production history than the Upper Fort Payne mounds of this study. Wolak et al. (2015) published a field guide examining several outcrops of Fort Payne Formation on Tennessee State Highway 52 near Celina, Tennessee in Clay County. The field guide includes details of the composition, fossil assemblage, and sedimentary architecture of an exposed carbonate mound, as well as nearby channels and a non-tectonic slump. All of these outcrops are in the lowermost Fort Payne Formation just above the contact with the Chattanooga Shale and, where present, the Maury Shale. Fossil assemblages and mound morphology in the lower Fort

Payne mounds exposed near Celina, Tennessee fit type 2 assemblage (Ausich and Meyer, 1990; Bridges et al., 1995; Wolak et al., 2015); the upper Fort Payne mounds, however, are likely type 1.

Cumberland Plateau overthrust overview

The Cumberland Plateau overthrust consists of a series of shallow, brittle thrust faults and short, steeply dipping dextral strike-slip (tear) faults that represent the westernmost Alleghanian deformation in the Appalachians at this latitude and crosses all three quadrangles mapped. The Cumberland Plateau overthrust is bounded on the northeast by the dextral Emory River tear fault; the strike-slip portion of the southwest end of the Pine Mountain thrust is the sinistral Jacksboro tear fault. Both faults originate in the Cambrian Rome Formation in the subsurface of the Valley and Ridge (Milici, 1963; Harris and Milici, 1977, Mitra, 1988). The Emory River-Cumberland Plateau overthrust fault system makes transitions from the predominantly strike-slip Emory River fault with only ~500 ft (150 m) of vertical displacement to the mixed thrust and short tear faults in the Lancing quadrangle near the Obed River. The Cumberland Plateau overthrust ramped from the Lower Cambrian Rome Formation of the Valley and Ridge province into Pennsylvanian sandstone and shale (Mitra, 1988). The Cumberland Plateau overthrust is fundamentally the same fault as the Sequatchie Valley fault that outcrops farther south in the breached portion of the Sequatchie anticline (Milici, 1963).

Previous work

Numerous geologists have worked on carbonate mounds in the Fort Payne Formation of the Appalachian basin, yet little has been published on details of the upper Fort Payne carbonate mounds. The most recent study focusing on upper Fort Payne carbonate mounds was conducted by MacQuown and Perkins (1982), whose results were based largely on petrologic studies of cores and well cuttings from natural gas and oil wells. MacQuown and Perkins (1982) determined the Fort Payne Formation in this area to consist of three shallow marine units: (1) a submound dolomite, chert, and evaporite unit; (2) a middle mound unit—the upper Fort Payne mound

Figure 1-4. Lower Fort Payne carbonate buildups on State Highway 52 less than two kilometers southeast of Celina, TN. A fossiliferous green shale core is overlain by carbonate packstone and wackestone. The folds are non-tectonic supratenuous folds. The Chattanooga Shale is located immediately below the green shale and is visible just to the right of this photo. This roadcut was opened to the public in November 2013. (Photo by Bob Hatcher.)

unit of this study— that is locally present and consists of calcilutite, calcisiltite, calcarenite, and calcirudite facies; and (3) a widespread, fine-grained, impermeable clastic unit.

Statler (1971) and Statler and Shaw (1971) published papers on oil production from the Fort Payne Formation in the Oneida-West field in Scott County in which they described the stratigraphic nature of the trap, but did not recognize the mound-like geometry. Milici et al. (1979) reviewed the general facies relationships of the Fort Payne Formation for northern Tennessee but did not focus on the subsurface carbonate mounds.

Unpublished master's theses by Lieber (1978) and Sciple (1981) at University of Kentucky and Vanderbilt University, respectively, focused on the upper Fort Payne carbonate mounds. Sciple (1981) interpreted the mounds to have formed in a slope environment dominated by carbonate sedimentation below the photic zone. Lieber (1978) focused on the Honey Creek field in Scott County, Tennessee. In both cases, the focus of the research was on interpreting cores, well cuttings, and thin sections of the subsurface Fort Payne Formation. All of these studies were limited to a small area, and the relative lack of geophysical well data at the time of the studies did not permit large-scale structural analyses.

The first reference to the structural geology of the Cumberland Plateau, of which the Lancing, Hebbertsburg, and Fox Creek quadrangles are a part, was by Safford (1869). In this publication, he was also the first to define the Sequatchie anticline. Keith (1897) mapped the area containing the Lancing, Hebbertsburg, and Fox Creek quadrangles at 1:125,000 scale, and noted "disturbances south of Obed River in Lavender Knob, Peavine Mountain, Hatfield Mountain, the northern slopes of Crab Orchard Mountain, and a sharp ridge running southeast from Nemo." This ridge is a fault scarp created by the Emory River tear fault, and the "disturbances" he recognized make up the Cumberland Plateau overthrust. Keith (1897) grouped most of the stratigraphic units recognized by the present study as part of the Lee Formation.

In 1923, Jillson was the first to recognize the Emory River fault zone, and he noted that the northeastern terminus of the Sequatchie anticline occurs just south of the Emory River fault. He also recognized some structures present where the Emory River fault transitions to

the Cumberland Plateau overthrust at Hatfield Mountain. However, he thought that the Emory River fault continues further northwestward past the junction of Hatfield Mountain and the Emory River fault. The first detailed stratigraphic studies for the Pennsylvanian of Tennessee were reported by Nelson (1925) and Glenn (1925). Rodgers (1950) reported a series of anticlines trending from Hatfield Mountain to the Potts Creek fault. These anticlines represent the faults of the Cumberland Plateau overthrust that were mapped in the present study.

Rascoe (1951) mapped the Fox Creek quadrangle at 1:24,000 scale as well as reporting on the structural and economic geology of the quadrangle as part of his master's thesis. Rascoe's (1951) geologic map was used for the present study, and many of the original geologic contacts were retained or modified only slightly in the final version following extensive field checking and addition of 181 new structural measurements. The stratigraphy was also updated to conform to the units mapped in Lancing and Hebbertsburg quads following the usage in the relatively recently published Camp Austin geologic map (Moore et al., 2004).

Stearns (1954) published a 1:125,000 scale map of the Ozone, Hebbertsburg, Dorton, and Fox Creek 7.5-minute quadrangles, as well as a detailed explanation of the stratigraphy. The map that he produced was used as a guideline for the 1:24,000 scale detailed geologic mapping completed for Fox Creek and Hebbertsburg as part of this project. With the exception of some units in the Crooked Fork Group, the stratigraphic units used in this project are similar to those of Stearns (1954). Three hundred nine new structural measurements were added to this quadrangle.

Wilson and Stearns (1958) described the main structural components of the Cumberland Plateau as "two components: (1) regional eastward dip of about 25 feet per mile off the Cincinnati arch: and (2) Pine Mountain, Cumberland Plateau, and Sequatchie Valley bedding thrusts, which strike northeastward and have roots in the Valley and Ridge province to the southeast." They described the Sequatchie Valley thrust as younger than the Cumberland Plateau overthrust, failing to recognize that they are genetically the same feature.

Milici (1963) was the first to recognize that the Sequatchie Valley thrust and the Cumberland Plateau overthrust were related features stating, "the Cumberland Plateau overthrust and Sequatchie Valley fault are genetically related. This is shown by: (1) the fault pattern at the northern end of Sequatchie anticline, (2) the cross-sectional symmetry of the northern portion of Sequatchie anticline, and (3) drill hole data." He also concluded that Sequatchie Valley, Grassy Cove, and Crab Orchard Cove are not windows, as suggested by Wilson and Stearns (1958). Milici et al. (1979) reviewed the entire Carboniferous in Tennessee including facies relationships in the Fort Payne Formation and stratigraphic overviews of the Pennsylvanian that were used for the present investigation.

Moore et al. (2004) published a detailed geologic map of the Camp Austin quadrangle, which is the 7.5-minute quadrangle adjacent to the east of the Lancing quadrangle (Fig. 1-1). The stratigraphy from this map was the primary source for creating the stratigraphic column and explanation for all three quadrangles of the present study. Presumably around the same time, Moore did some preliminary field work in the Lancing quadrangle that was never published due to lack of control in several areas, including Hatfield Mountain. Moore's preliminary field map was obtained from the Tennessee Division of Geology to aid in this study and structural data from his map have been incorporated. However, there were not any supporting notes or explanations. A reconnaissance map from Donald F. Gilmore that showed only contacts and no structural data was also used. As part of the geologic mapping of this quad, 536 new structural measurements were added.

CHAPTER II

STRATIGRAPHY

Introduction

The subsurface units described here are the Ordovician Deicke bentonite, the Mississippian-Devonian Chattanooga Shale, and the Mississippian Fort Payne Formation (Fig. 2-1). These units are important because of their relationship to the upper Fort Payne mounds of the Cumberland Plateau, and because mechanical behavior of stratigraphic units in the subsurface is vital to understanding the behavior of faults on the Plateau. These units were recognizable in well logs, making them strong candidates for subsurface interpolation mapping. The Deicke bentonite is widespread, and its homogenous nature is critical for establishing a datum below the pre-Devonian unconformity that lies just below the Chattanooga Shale. The properties of the Chattanooga Shale make it interesting for several reasons. From a tectonic standpoint, it provides evidence for clastic deposition related to the Neoacadian orogeny (Hatcher et al., 2007a). The mechanical strength of the Chattanooga Shale influences the Pine Mountain thrust and Cumberland Plateau overthrust. The Chattanooga Shale is also important for carbonate mound placement as a datum for deposition of the Fort Payne Formation. Understanding the Pennsylvanian stratigraphy in the mapped area was necessary for differentiating units in the field.

Regional stratigraphic framework

The sedimentary sequence of the southern Appalachian foreland fold-thrust belt thickens eastward and overlies southeast dipping autochthonous Mesoproterozoic basement (Hatcher et al., 2007b). The basal décollement propagated through the Early to Middle Cambrian rifted-margin clastic units (Rome and Conasauga Group) throughout most of the southern Appalachians (Rodgers, 1953; Milici, 1975; Thomas, 1988; Hatcher et al., 2007b). The Rome Formation (Fig. 2-1) had a westward clastic source and consists of primarily shale and siltstone, with lesser amounts of sandstone, dolostone, limestone, and evaporite (Hatcher et al., 2007b). Conasauga Group (Fig. 2-1) facies also vary regionally consisting of carbonate-rich rocks to the

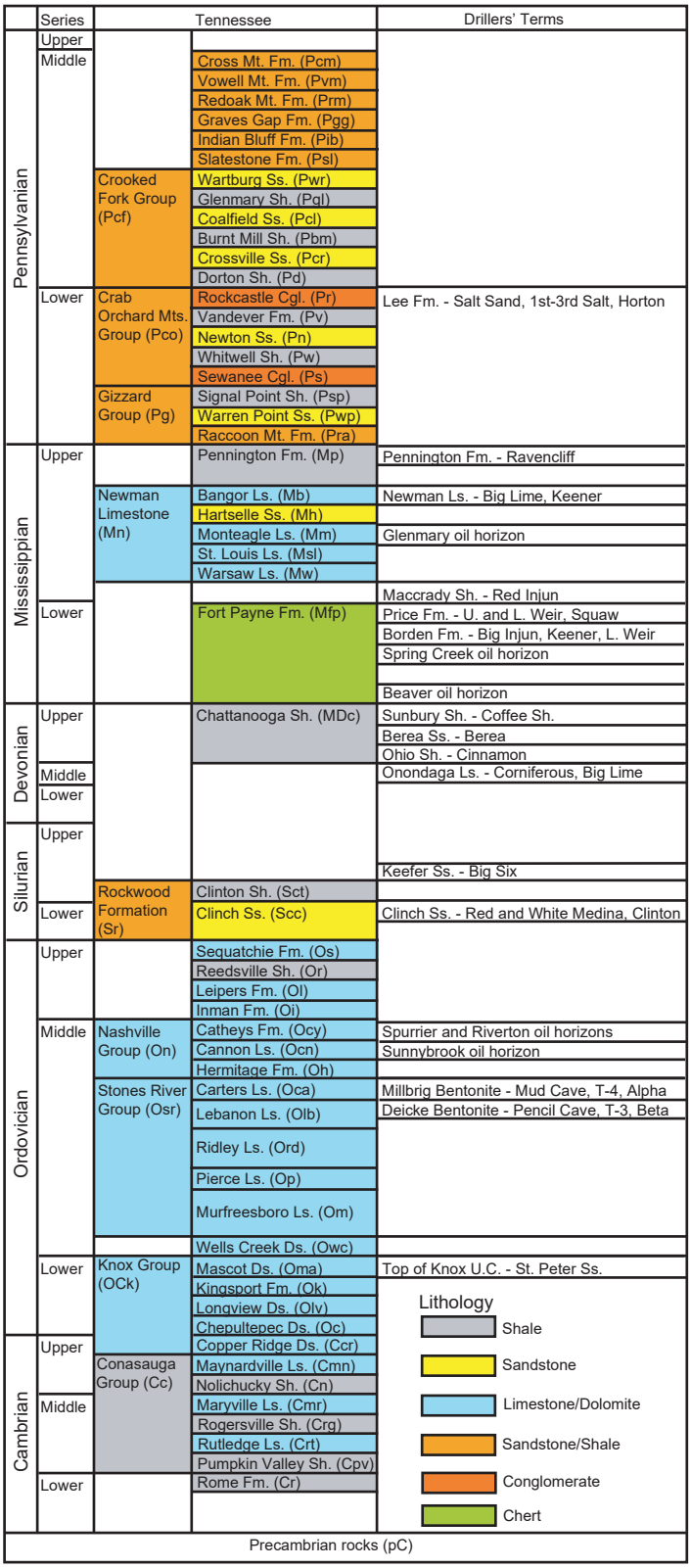


Figure 2-1. Stratigraphic chart for the Cumberland Plateau in Tennessee with common drillers' terminology. Deicke bentonite is located in the upper Carters Limestone. (Modified from Evenick, 2006).

east and becoming increasingly clastic to the west (Hatcher et al., 2007b).The Late Cambrian to Early Ordovician Knox Group (Fig. 2-1) is the mechanically strong stratigraphic unit in the carbonate sequence and is present across the entire southern Appalachian foreland fold-thrust belt (Hatcher et al., 2007b). The Middle Ordovician Chickamauga Group (Fig. 2-1) contains mudstone-shale-rich intervals that are mechanically weak in which a middle detachment exists (Hatcher et al., 2007b). In northeast Tennessee and Virginia, an upper detachment exists in the mechanically weak Devonian-Mississippian Chattanooga Shale (Mitra, 1988; Hatcher et al., 2007b) (Fig. 2-1). This upper detachment underlies the entire Pine Mountain thrust sheet (Fig. 1-3). Above the Chattanooga Shale is a Mississippian carbonate sequence consisting mostly of mechanically competent limestone and dolomite with increasing clastic influence in the upper Mississippian Pennington Formation (Milici et al., 1979). Above the Pennington Formation, the lower Pennsylvanian is made up of sandstone, siltstone, shale, and coal (Milici et al., 1979) (Fig. 2-1). The Cumberland Plateau overthrust sheet is underlain by an upper detachment in the shale and coal of the Gizzard Group (Hatcher et al., 2007b) (Fig. 2-1; Plate 2).

Subsurface units of interest

Three units in the subsurface of the Cumberland Plateau were used for analyzing tectonic control of the deposition of Upper Fort Payne carbonate mounds: the Ordovician Deicke bentonite; the Upper Devonian-Lower Mississippian Chattanooga Shale; and the Mississippian Fort Payne Formation. All three are easily recognized in gamma ray and density logs (Fig. 2-2), as well as associated drillers' picks from well history documents.

<u>Deicke bentonite</u>

The Deicke bentonite, referred to as pencil cave or T-3 in drillers' logs, is located in the Ordovician Carters Limestone (Evenick and Hatcher, 2006). The Deicke bentonite is easy to recognize in well logs because it generally has a gamma ray amplitude of > 80 API, is less than 30 in (75 cm) thick (Wilson, 1949; Huff, 1983; Huff and Kolata, 1990) and is identifiable as a low density anomaly (Luthi, 2001). The key to distinguishing this bentonite layer is the presence of a

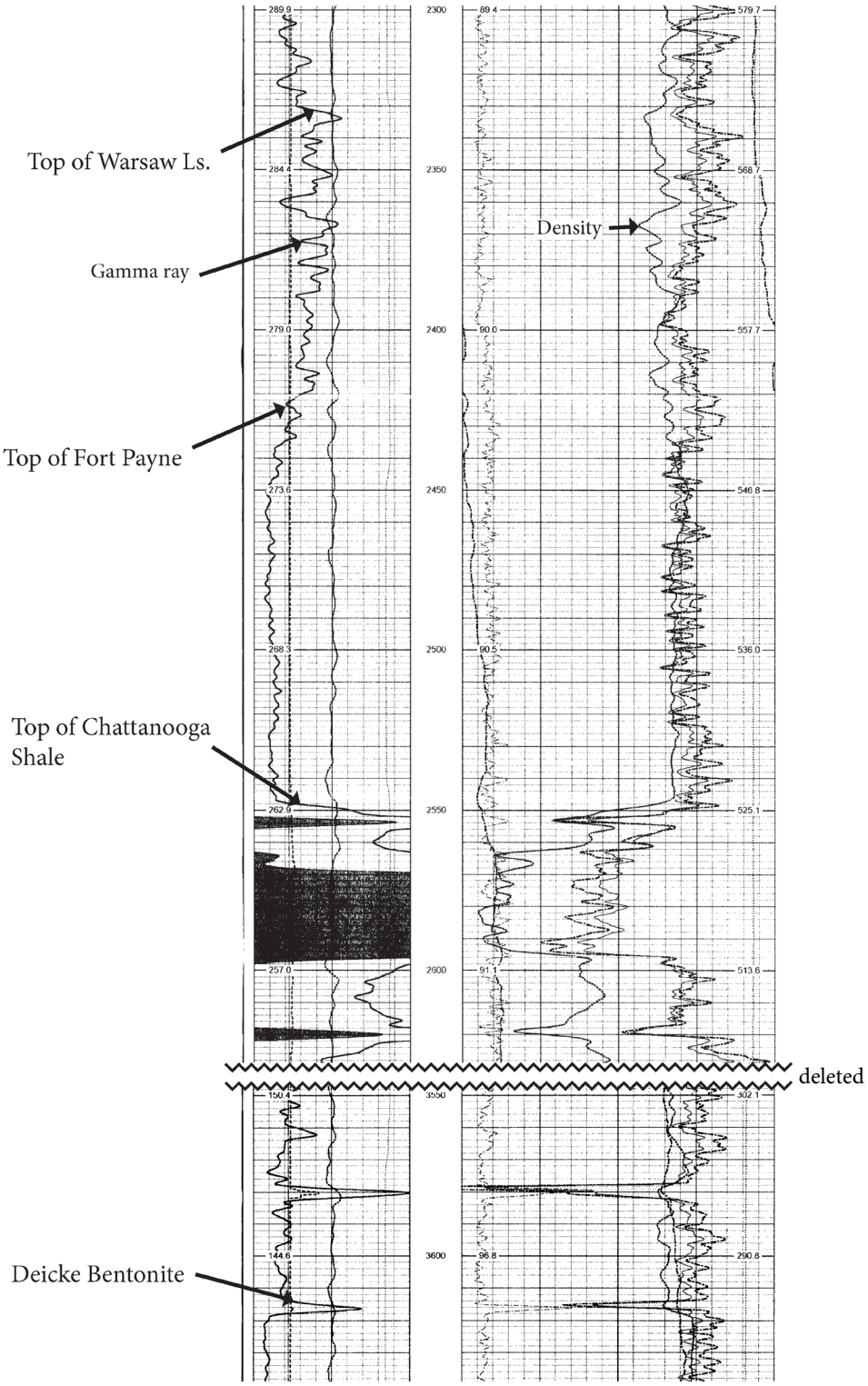


Figure 2-2. Well log from Heartwood #3 (permit 9896) in eastern Morgan County. The Maury Shale is absent above the Chattanooga Shale in this location. Note that the well log was modified to remove Silurian and Ordovician sections between 2630 and 3550 feet.

density anomaly along with a gamma ray anomaly (Fig. 2-2). The Deicke bentonite was chosen as a geophysical marker for this study because of its distinguishing characteristics and widespread occurrence in the study area. This is the only marker chosen below the pre-Chattanooga Shale unconformity, and it is used primarily as a reliable marker to create an isopach map of the units between the Deicke bentonite and the pre-Chattanooga Shale unconformity.

Pre-Chattanooga Shale unconformity

The Chattanooga Shale was deposited on a regional unconformity surface that truncates several middle Ordovician to late Devonian formations (Milici et al., 1979; Hatcher et al., 2007a). The unconformity occurs in the subsurface of the Cumberland Plateau and eastern Highland Rim, from the Valley and Ridge province on the east to the flank of the Nashville dome to the west (Evenick and Hatcher, 2006; Hatcher et al., 2007a, their Fig. 13)(Fig. 1-2).

Chattanooga Shale

The Fort Payne Formation and Maury Shale (where present, mapped as part of the Fort Payne due to its diminutive thickness) unconformably overlie the Chattanooga Shale (Hayes, 1891). The Chattanooga Shale is upper Devonian-lower Mississippian black shale (Milici et al., 1979). Thickness of the Chattanooga Shale is variable, but it averages ~30 ft (10 m) in the study area and thickens considerably to the east where it may be as thick as 2,000 ft (650 m) (Milici et al., 1979; Moore and Horton, 1999). In the study area, this unit was deposited at the south end of the Acadian-Neoacadian clastic wedge and pinches out in southern Tennessee and northern Alabama (Moore and Horton, 1999; Ettensohn, 2004). In this area, the Chattanooga Shale has a southeastward dip of ~25 ft/mile (~5 m/km) off of the eastern limb of the Nashville dome and is important as a depositional surface for the lower Mississippian Fort Payne. The Chattanooga Shale is readily distinguished on a gamma ray log by its high natural uranium content; because of its stratigraphic position above a major unconformity, the Chattanooga Shale can provide valuable insight into the pre- and post-Devonian structural history of this area.

Maury Shale

The Maury Shale is greenish-gray, glauconitic, silty shale that lies, where present, between the Fort Payne Formation and the Chattanooga Shale (MacQuown and Perkins, 1982). This unit is never thicker than approximately 20 feet (6 meters) (Milici et al., 1979) and is often not present in the study area; consequently, it has been included in the Fort Payne Formation in this study for the purpose of well log analysis.

Fort Payne Formation

The Fort Payne Formation is entirely early to middle Mississippian and includes all beds between the Maury Shale and the Warsaw Limestone (Milici et al., 1979; Ettensohn, 2009, his Fig. 3.1) (Fig. 2-1). Above the Fort Payne Formation is a carbonate sequence consisting of the Warsaw Limestone, St. Louis Limestone, Monteagle Limestone, Hartselle Sandstone, Bangor Limestone, and Pennington Formation (Milici, 1979; Ettensohn, 2009) (Fig. 2-1). The Fort Payne Formation is widespread and consists of heterogeneous facies in Alabama, Tennessee, and Kentucky; it is dominantly chert in Alabama and southern Sequatchie Valley, but grades into a carbonate-rich lithology with various amounts of silicastone, wackestone, floatstone, argillaceous, clastic, and dolomitic components northward into Tennessee and Kentucky (Milici et al., 1979). The Fort Payne Formation grades eastward into the Grainger Formation and overlies the Grainger where the two coexist (Neuman and Nelson, 1965; Milici et al., 1979; Ettensohn, 2009) (Fig. 2-1). This study area is restricted to northeast-central Tennessee, focusing on the Cumberland Plateau north of the Sequatchie anticline. The Fort Payne in this area extends beneath the entire Plateau except where it crops out along the eastern side of the Sequatchie Valley and just northwest of the Pine Mountain thrust in Elk Valley (Milici et al., 1979).

In the northern Cumberland Plateau, the dominant lithology of the subsurface Fort Payne Formation is cherty dolomite overlain locally by bryozoan carbonate buildups with a clastic cap (MacQuown and Perkins, 1982). The entire Mississippian sequence of the northern Cumberland Plateau is overlain by Pennsylvanian rocks, and is thus studied only by well log interpretation. The

gamma ray signature of the interbedded shale and limestone of the overlying Warsaw Limestone was used to distinguish this unit from the less argillaceous limestone gamma ray signature of the Fort Payne Formation (Fig. 2-2).

Upper Fort Payne carbonate mound stratigraphy

MacQuown and Perkins (1982) described three units of the Fort Payne Formation where carbonate mounds occur in the subsurface of the northern Cumberland Plateau as a submound unit, a mound unit, and a detrital facies. The submound unit includes cherty, limy, dolomitic, evaporitic (primary gypsum), and silty microfacies (MacQuown and Perkins, 1982). The detrital facies is widespread in the upper part of the Fort Payne Formation and consists of shale, siltstone, minor limestone, and calcitic fossil fragments (MacQuown and Perkins, 1982).

The mound unit is divided into a mud-supported microfacies, and a grain-supported microfacies that are irregularly interbedded with one another (MacQuown and Perkins, 1982). The mud-supported microfacies is the dominant facies within the mounds (~70%) and consists of fossiliferous wackestone (fine skeletal grains, disarticulated ostracodes, bryozoan fragments, and sponge spicules) and mudstone (MacQuown and Perkins, 1982). Grain-supported microfacies makes up the other ~30% of the mound unit and consists of packstone and grainstone (MacQuown and Perkins, 1982). The packstone contains intergranular micrite and consists of large bryozoan fossil fragments with a minor component of crinoids and a small amount of depositional evaporites locally (MacQuown and Perkins, 1982). The grainstone component consists of the same fossil assemblage but has no intergranular micrite or cement, and is the primary petroleum reservoir rock of the upper Fort Payne carbonate mounds because of its increased porosity (up to 12%) (Sciple, 1981; MacQuown and Perkins, 1982).

Rocks exposed in mapped area

Rock units at the surface in the mapped area lay more than 700 ft (200 m) above Fort Payne Formation (Fig. 2-1; 2-3; Plate 1). The entire section of Pennsylvanian rock in the study area is ~1,000 ft (300 m) thick and consists of Gizzard Group, Crab Orchard Group, and Crooked Fork

Figure 2-3. Generalized stratigraphic column of the study area. Modified from Stearns, 1954 and Moore et al., 2004.

SYSTEM AND SERIES		GROUP	THICKNESS IN FEET	LITHOLOGY & MAP SYMBOL	DESCRIPTION
PENNSYLVANIAN	Lower Pennsylvanian	Crooked Fork	90-205	IPn	**Newton Sandstone** Fine- to coarse-grained sandstone with quartz pebbles locally; thin- to thick-bedded, crossbedded in part, well-cemented.
			15-90	IPw	**Whitwell Shale** Gray silty, carbonaceous shale interlaminated with sandstone. Richland coal occurs at or near base and thin Sewanee coal occurs locally just above middle.
			70-260	IPs	**Sewanee Conglomerate** Fine- to coarse-grained sandstone, medium- to thick- and very thick-bedded, cross-bedded, sparsely to very conglomeratic. Numerous quartz pebbles as much as 1 inch in diameter.
		Gizzard	~250	IPg	**Gizzard Group** Shale and siltstone with interbedded laminae of silty sandstone and ironstone nodules; sandstone, very fine- to fine-grained, thin- to medium-bedded; Bon Air coal occurs locally in two to three thin seams.

Figure 2-3. Continued.

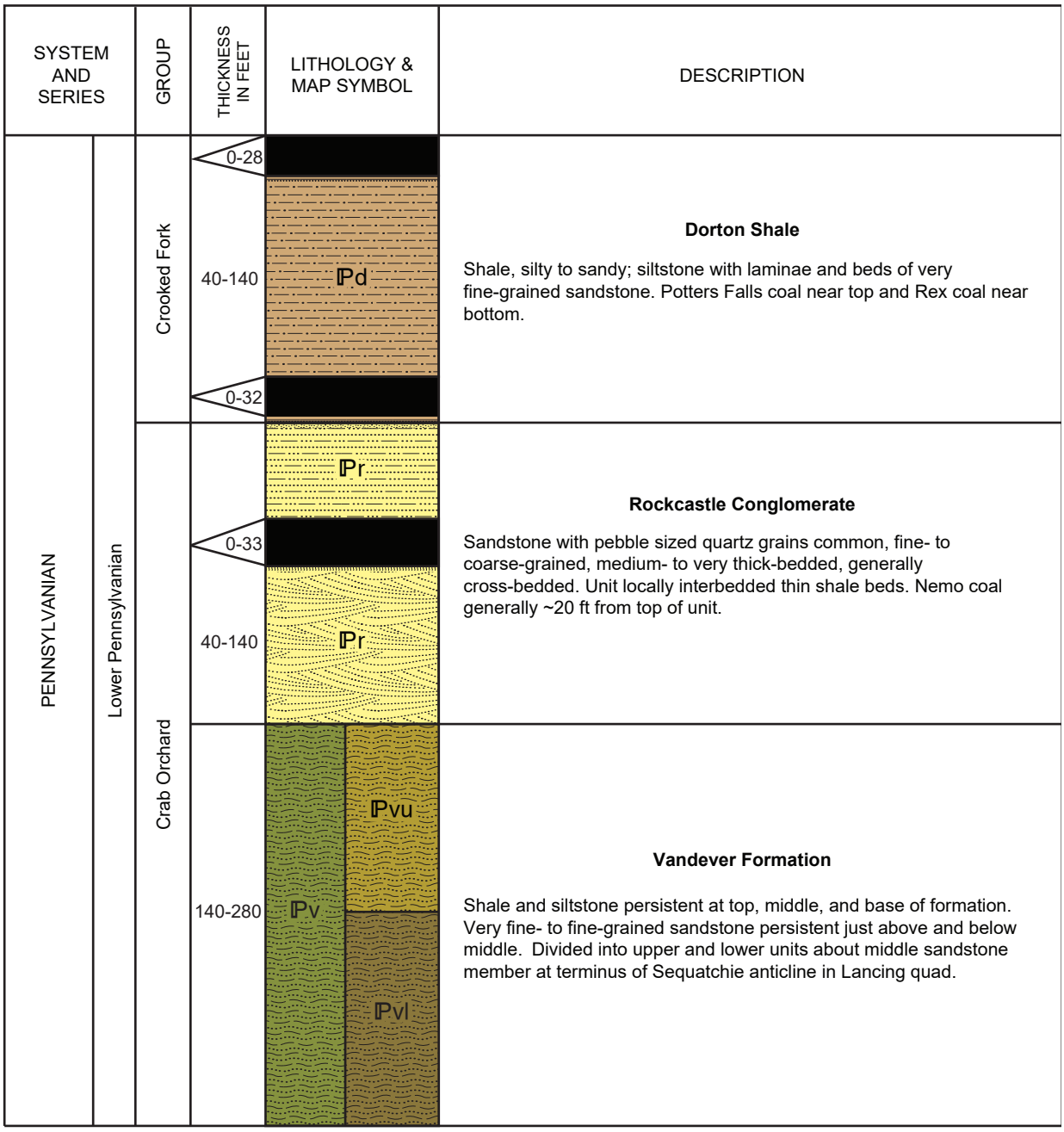


Figure 2-3. Continued.

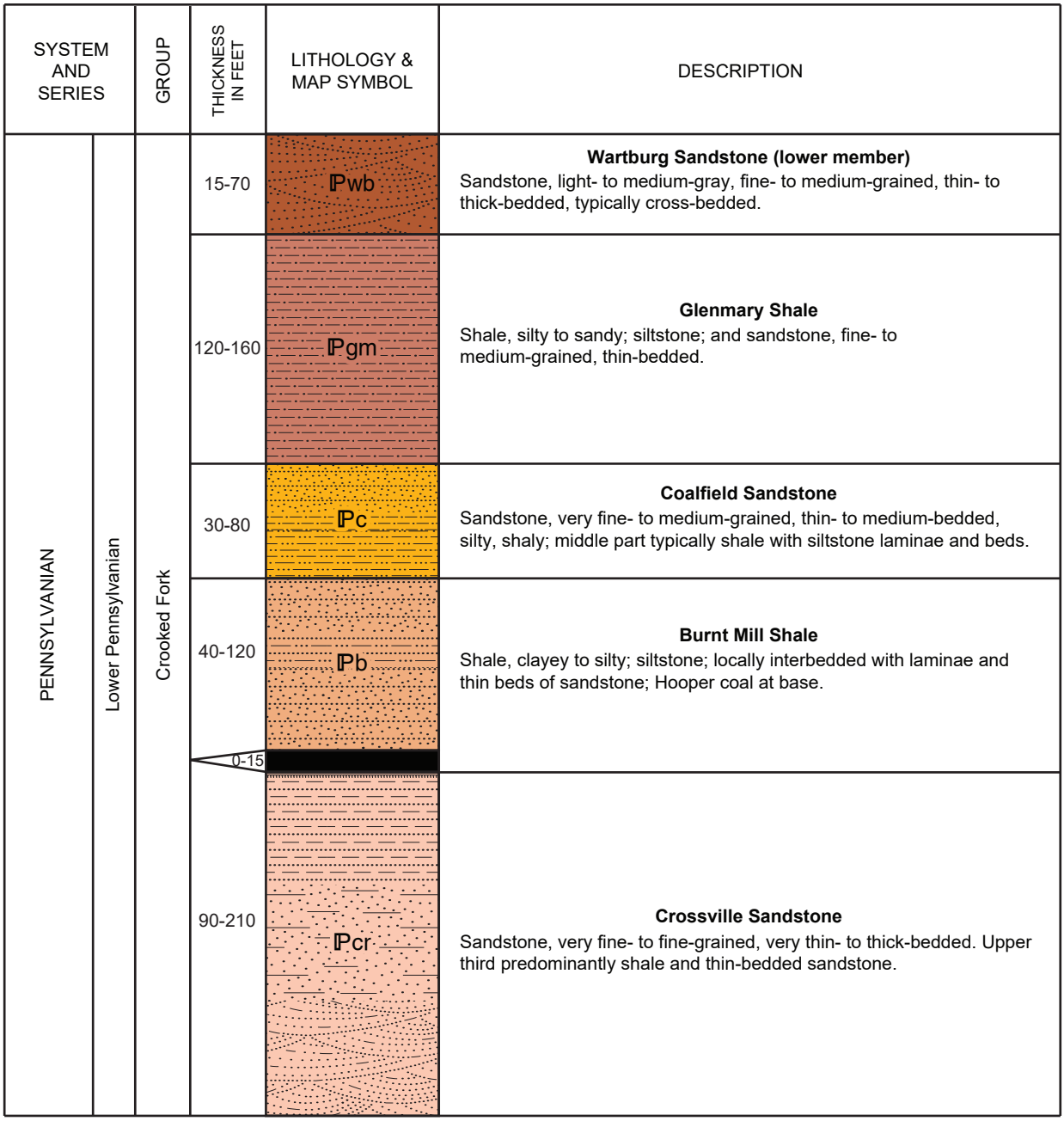


Figure 2-3. Continued.

Group (Fig. 2-3). These units all have lower Pennsylvanian ages (Fig. 2-1) and consist of shale, siltstone, sandstone, and conglomerate (Ferm et al., 1972; Greb et al., 2009). On a regional basis, the sequence from the red and green shale, limestone, and fine-grained argillaceous sandstone of the upper Mississippian Pennington Formation through the quartz-dominated sandstones to the shale-dominated section above the Crooked Fork Group represents a progradational transition from marine deposits, to littoral deposits, to delta-plain facies (Ferm, 1974). The lower Pennsylvanian rocks of this study are part of the littoral facies and almost all have a terrigenous origin (Milici, 1974).

Many of the Pennsylvanian units in this study were difficult to differentiate on lithologic characteristics alone. Because of the varying nature of the grain size and bedding of the sandstone units, without stratigraphic context a given sample could have come from one of several different units. For example, the Rockcastle Conglomerate contains strata that are extremely conglomeratic, similar to the Sewanee, and fine-grained, cross-bedded layers similar to the Crossville. Furthermore, the shale units are similar to one another, and most of the sandstone units contain some amount of shale and siltstone as well. Therefore, position in the stratigraphic and structural context were often relied upon to determine units, especially for small outcrops.

The Pennsylvanian rock units consist of thin to massive bedded quartz-rich sandstones (Sewanee Conglomerate, Newton Sandstone, Rockcastle Conglomerate, Crossville Sandstone, Coalfield Sandstone, and Wartburg Sandstone) and the mostly shaly strata between them (Whitwell Shale, Vandever Formation, Dorton Shale, Burnt Mill Shale, and Glenmary Shale). The Vandever Formation is the only shaly unit with appreciable amounts of sandstone with a fine-grained sandstone member near the middle of the unit. The topography of the area is strongly controlled by alternating resistance to weathering of the competent sandstone units and readily weathered shale units. Generally, ridges and small mountains are capped by sandstone, while shale—most commonly the Vandever Formation—often underlies valleys and river gorges. The Wartburg Sandstone and the Rockcastle Conglomerate are the only units that form large cliffs in the area, and the cliffs of the Wartburg are limited to a relatively small area near the eastern

boundary of the Lancing quadrangle. The Rockcastle, however, produces persistent cliffs and flats throughout the study area and is consistently present as a cliff-forming unit along the Clear Creek, Daddy's Creek, Emory River, and Obed River gorges.

Gizzard Group

In the mapped area, the Gizzard Group (Fig. 2-3) (Safford, 1869) is exposed only in small, isolated areas of the Lancing quadrangle near Hatfield Mountain and near the southern boundary of the map at the northern terminus of the Sequatchie anticline. The Gizzard Group consists of the Raccoon Mountain Formation, Warren Point Sandstone, and Signal Point Shale (Milici et al., 1979). Siltstone of the Signal Point shale unit is the only part of the Gizzard Group that is present at the surface and was mapped in stratigraphic relation to the overlying Sewanee Conglomerate.

Crab Orchard Mountains Group

The Crab Orchard Mountains Group (Wilson et al., 1956) includes the Sewanee Conglomerate (Safford, 1893), Newtown Sandstone (Nelson, 1925), Vandever Formation (Nelson, 1925), and Rockcastle Conglomerate (Campbell, 1898). North of the mapped area, in the northwestern part of the Cumberland Plateau, all of the units below the Rockcastle Conglomerate grade laterally into the Fentress Formation (Milici et al., 1979). Rocks of the Crab Orchard Mountains Group make up the vast majority of the three quadrangles of interest, and the Rockcastle Conglomerate is the most widespread map unit.

<u>Sewanee Conglomerate</u>

The type locality for the Sewanee Conglomerate is on the campus of the University of the South in Sewanee, Tennessee, and was named by Safford (1893). It is composed of fine- to coarse-grained sandstone and contains quartz pebbles that make this unit sparsely to very conglomeratic (Milici et al., 1979; Moore et al., 2004) (Fig. 2-4). The entire thickness of the Sewanee Conglomerate is present only in the southern portion of the Lancing quadrangle. Here, deformation inhibits reliable thickness measurement, but it can range from 70 ft-260 ft (21-80

Figure 2-4. Sample of coarse-grained Sewanee Conglomerate from core of the Sequatchie anticline east of the Crab Orchard Mountains in the Catoosa Wildlife Management Area. Station L002. Pebbles up to 0.5 cm are made of quartz. Pen is ~14 cm.

m) in nearby exposures on the Cumberland Plateau (Moore et al., 2004). In the Crab Orchard Mountains area, the Sewanee Conglomerate averages about 80 feet (Stearns, 1954).

Whitwell Shale

The Whitwell Shale was named by Butts and Nelson (1925) from exposures near Whitwell, Marion County, Tennessee. The Whitwell Shale is composed of dark, silty shale and minor fine-grained sandstone (Milici et al., 1979). The unit includes all strata between the top of the Sewanee Conglomerate and the base of the Newton Sandstone (Stearns, 1954) and ranges from 15 to 90 feet (5-27 meters) in the field area. South of the study area, the Whitwell Shale contains economic coal consisting of the Richland and Sewanee coal seams (Milici et al., 1979). In the study area, Whitwell Shale is rarely exposed except on the flanks of the Sequatchie anticline in the southern part of the Lancing quadrangle and along the Cumberland Plateau overthrust near the mouth of Yellow Creek Ford in the Hebbertsburg quadrangle.

Newton Sandstone

The Newton Sandstone (Nelson, 1925) is 90-205 ft (27-62 m) thick in the mapped area, although the entire thickness is rarely exposed, and is generally deformed where it appears. This unit was referred to as the Bon Air Sandstone by some workers, including Stearns (1954), and as the Herbert Sandstone by Rascoe (1951). Since both the Bon Air Sandstone and Herbert Sandstone names represent the same unit as the Newton Sandstone with no increase in detail at 1:24,000, this study uses Newton Sandstone to be consistent with the current Tennessee Division of Geology and United States Geological Survey (USGS) nomenclature as well as recent work by Moore et al. (2004) in the Camp Austin quadrangle, directly east of the Lancing quadrangle.

In the Fox Creek quadrangle, Rascoe (1951) postulated that the Newton Sandstone is either not present or grades to a thin shale in the Obed gorge, and therefore did not include it as a mappable unit. Rascoe (1951) also described the Herbert Conglomerate as a separate, non-conglomeratic, fine-grained, sandstone unit. However, after detailed mapping in the Lancing, Hebbertsburg, and Fox Creek quadrangles, it seems more likely that the Herbert Conglomerate

of Rascoe (1951) represents a fine-grained sandstone member of the Vandever Formation (Plate 1); Newton Sandstone is present below the Vandever Formation, but was mapped by Rascoe (1951) as the Sewanee Conglomerate. The best exposure of Newton Sandstone in the Fox Creek quadrangle is near Adams Bridge on Tennessee Highway 129; in this locality the unit is conglomeratic and resembles the Sewanee Conglomerate (Fig. 2-5). My mapping is consistent with Stearns' (1954) mapping, with the only major difference being the use of the name Newtown Sandstone for this study, rather than Bon Air Sandstone.

Vandever Formation

The Vandever Formation was named by Butts (1916) from exposure in the small mining village of Vandever in southern Cumberland County. This formation ranges from 140 to 280 ft (43-85 m) in the mapping area. The Vandever Formation is generally shaly, but also contains sandstone, siltstone, and coal (Fig. 2-6). It can locally be divided into upper and lower units by the presence of a 20-60 ft (6-18 m) thick fine-grained sandstone member. This sandstone member is not persistent enough, nor does it influence topography sufficiently to be traced throughout the mapped area. Although the Vandever Formation is commonly present at the surface, it is rarely exposed, and the contact with the overlying Rockcastle Conglomerate is generally inferred to be at the base of Rockcastle Conglomerate sandstone cliffs. Thrust faults related to the Cumberland Plateau overthrust propagated through the Vandever Formation shale commonly as bedding faults.

Rockcastle Conglomerate

The Rockcastle Conglomerate (Wanless, 1946) was named from exposures in Rockcastle Cove near Jamestown, Tennessee. This unit is 90 to 210 ft (27-64 m) thick in the mapped area, and consists of generally fine- to medium-grained sandstone with scattered to abundant quartz pebbles (Fig. 2-7). It ranges from non-conglomeratic to very conglomeratic with the most conglomeratic exposures generally near the base, and the non-conglomeratic and fine-grained, thin-bedded sandstone strata frequently occurring near the top. The Rockcastle also contains

(A)

(B)

Figure 2-5. (A and B) Conglomeratic facies of the Newton Sandstone underneath Adam's Bridge on the Obed River. Pebbles up to 0.5 cm are made of quartz. Book is 19 x 12 cm. Station FC094.

(A)

(B)

Figure 2-6. (A) Thin- to medium-bedded sandstone in the Vandever Formation. Outcrop is on eastern flank of Sequatchie anticline in Catoosa Wildlife Management Area. Station L154. (Hammer is ~30 cm long). (B) Vandever Formation siltstone and shale in the Lancing quadrangle (Hammer is ~35 cm long).

(A)

(B)

Figure 2-7. (A) Jointed Rockcastle Conglomerate on Hatfield Mountain near Cumberland Plateau overthrust in Lancing quadrangle. Station L089. Pencil is ~14.5 cm. (B) Rockcastle Conglomerate cliff ~60ft (20 m) high on the west side of Daddy's Creek in Hebbertsburg quadrangle.

minor shale interbeds, the most persistent of which generally occur about 20 feet (6 m) from the top of the unit; the Nemo coal seam commonly lies just below this shale (Moore et al., 2004). The upper Rockcastle is rarely exposed. The Rockcastle is a key stratigraphic unit in the area, and represents the bedrock of a large percentage of the mapped area that controls topography. Where faulted, Rockcastle Conglomerate is microfractured into dense, yellowish-gray cataclasite (Moore et al., 2004).

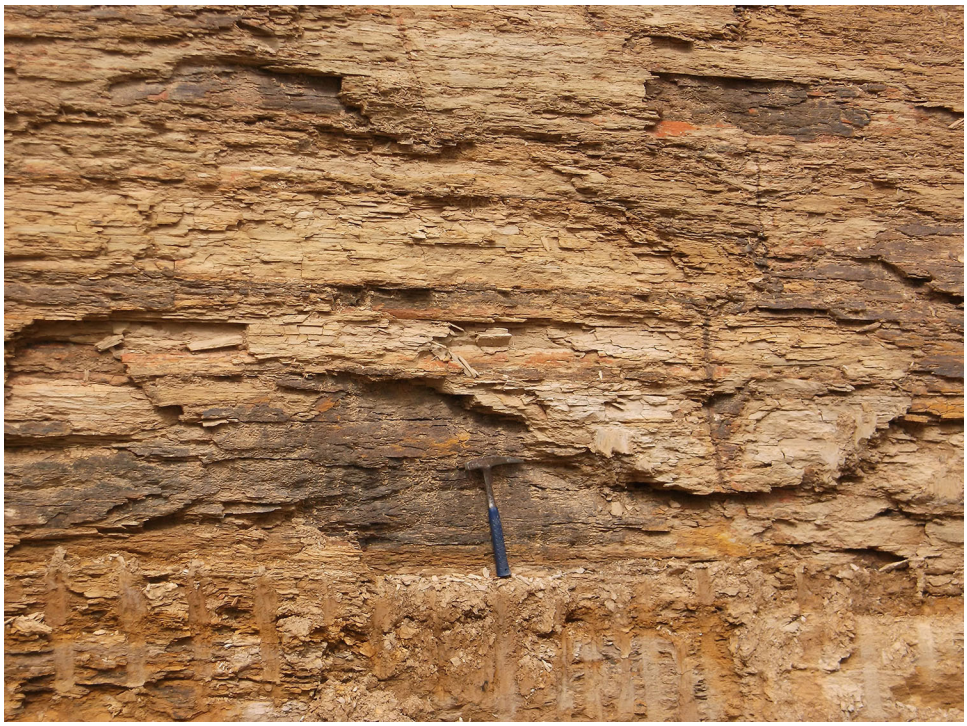
Crooked Fork Group

The Crooked Fork Group includes three sandstone and three shale formations: the Dorton Shale (Wilson et al., 1956), the Crossville Sandstone (Wanless, 1946), the Burnt Mill Shale (Wilson et al., 1956), the Coalfield Sandstone (Wilson et al., 1956), the Glenmary Shale (Wilson et al., 1956), and the Wartburg Sandstone (Keith, 1895). All of these units are present in the mapped area, but units above the Burnt Mill Shale are present only in the eastern part of the Lancing quadrangle, north of the Emory River fault in the Wartburg basin. Quartz pebbles that are common in the Crab Orchard Mountains Group are rare in the Crooked Fork Group, and the sandstone is generally finer-grained than those of the Crab Orchard Mountains Group (Milici et al., 1979). According to Milici et al. (1979), strata of the Crooked Fork Group are transitional from a littoral beach-barrier sequence to a delta-plain sequence. Several units of the Crooked Fork Group differ in name from previous mapping by Stearns (1954) in the Crab Orchard Mountains area. In earlier work, the Duskin Creek Formation included what has been divided here as Dorton Shale, Crossville Sandstone, and Burnt Mill Shale. The Crossville Sandstone was still mapped distinctly in the previous work as a middle sandstone member of the Duskin Creek Formation, and the Dorton and Burnt Mill Shales of this study were previously mapped as lower and upper Duskin Creek Formation, respectively.

<u>Dorton Shale</u>

The Dorton Shale (Wilson et al., 1956) (Fig. 2-8) is 40-140 ft (12-42 m) thick in the study area with the thickest sections on the northwest side of the Cumberland Plateau overthrust in

(A)



(B)

Figure 2-8. (A) Orange to dark olive, fissile Dorton Shale <1 mile east of Nemo Bridge in Lancing quadrangle. Hammer is ~35 cm. (B) Red arrow points to Rex coal seam in Dorton Shale near intersection of Fritts Rd. and Montgomery Rd. This outcrop is in the Camp Austin quadrangle less than a mile from the eastern boundary of the Lancing quadrangle. Coal bed is 3 ft (1 m) thick. Photo taken by Bob Gelinas.

Lancing and Hebbertsburg quadrangles, and the thinnest sections north of the Emory River fault in the Wartburg Basin portion of the Lancing quadrangle. This units consists of a dark-gray to olive-black shale with minor siltstone and very fine-grained sandstone laminae and beds (Moore et al., 2004). The Potters Falls and Rex coal seams occur near the top and bottom, respectively, of this unit (Moore et al., 2004).

Crossville Sandstone

The Crossville Sandstone (Wanless, 1946) includes all of the rocks between the Dorton Shale and the Burnt Mill Shale and varies in thickness between 40 and 240 ft (12-73 meters) (Figs. 2-3, 2-9). This units consists of fine-grained, cross-bedded sandstone and commonly exhibits gray, yellow, red, purple, and orange coloring with prominent Liesegang banding (Stearns, 1954). Like the Rockcastle Conglomerate, the Crossville Sandstone is microfractured into a dense, yellowish-gray cataclasite where faulted (Moore et al., 2004) (Fig. 2-9). Some of the strata exhibit flaggy, even bedding; in these locations the Crossville Sandstone is used for building and landscaping purposes and is referred to industrially as Crab Orchard Stone. The Crossville Sandstone is common in structurally low areas in the Lancing quadrangle, less common in the Hebbertsburg quadrangle, and present only as small outliers in the Fox Creek quadrangle.

Burnt Mill Shale

The Burnt Mill Shale (Wilson et al., 1956) (Fig. 2-10) consists of dark-gray to olive-black shale with minor components of olive-gray to olive-black siltstone and very fine- to fine-grained sandstone (Moore et al., 2004). The Hooper coal occurs locally near the base of the unit (Moore et al., 2004).

Coalfield Sandstone

The Coalfield Sandstone (Wilson et al., 1956) (Fig. 2-10) is 30 to 80 ft (9-24 m) in the study area and is present only east of Lancing, Tennessee, and north of the Emory River fault in the Lancing quadrangle. It consists of very fine- to medium-grained, thin- to medium-bedded

(A)

(B)

Figure 2-9. (A) Thin- to medium-bedded and shaly upper Crossville Sandstone on Pilot Knob Mountain in Hebbertsberg quadrangle. Station H020. Book is 19 x 12 cm. (B) Contact between Dorton Shale (dark shale on bottom) and Crossville Sandstone (tan, cross-bedded sandstone on top). Trees on top of ridge are ~30 ft (10 m) tall.

(A)

(B)

Figure 2-10. (A) Contact between Burnt Mill Shale (dark shale on bottom) and Coalfield Sandstone (on top). This outcrop is less than 1 km NE of Lancing Post Office on Tennessee Hwy 62. Person for scale (~2 m). (B) Fine-grained thin- to medium-bedded Coalfield Sandstone with ~0.5 m shale bed. Bob Gelinas for scale (~2 m). This photo from same location as (A). Both photos by J. Brad Stephenson.

sandstone with common shale beds (Moore et al., 2004). The Coalfield Sandstone is difficult to distinguish from the Crossville Sandstone.

Glenmary Shale

The Glenmary Shale (Wilson et al., 1956) ranges from 120-160 ft (37-49 m) thick where present. It is olive-gray to olive-black shale with minor siltstone and fine- to medium-grained beds of sandstone.

Wartburg Sandstone

Only the lowest of three members in the Wartburg Sandstone (Keith, 1895) is present in the study area. The lower member of the Wartburg Sandstone is fine- to medium-grained, thin- to thick-bedded, and typically cross-bedded (Moore et al., 2004). Where this unit is exposed in the easternmost part of the Lancing quadrangle, it is generally a cliff-forming unit; large boulders of Wartburg Sandstone are preserved downslope from an outcrop as part of a Quaternary debris flow in at least one location (Plate 1).

CHAPTER III

STRUCTURE

Introduction

Several regional structures affected the Cumberland Plateau both at the surface and at depth. Subsurface maps were constructed for stratigraphic units that cannot be studied directly by field observation and must be understood through proxies—in this case, gamma ray and density logs from oil and gas industry well logs. These point data alone, however, do not adequately represent a two-dimensional surface, so the stratigraphic horizon picks were interpolated using empirical Bayesian kriging, a geostatistical method, to create surfaces on several stratigraphic units. Four thousand five hundred ninety-six available well logs for Morgan, Scott, Fentress, Anderson, and Cumberland Counties were used to make these northern Cumberland Plateau subsurface maps (Fig. 3-1). The locations of upper Fort Payne carbonate mounds were then plotted in relation to the structure in the subsurface.

The surface geology of three 7.5-minute quadrangles was investigated in detail, and over 1,400 bedding measurements were used to create detailed geologic maps (Fig. 3-2; Plate 1). Stereonets of poles to bedding planes were plotted in order to quantify, summarize, and visualize the structural data at map scale. Four cross sections were then constructed using surface geology, oil and gas well logs, and knowledge of the regional geology (Fig. 3-3; Plate 2).

SURFACE GEOLOGY

Alleghanian orogeny

The Alleghanian continent-continent collision between Laurentia and Gondwana emplaced the Blue Ridge-Piedmont megathrust indenter leading to Late Carboniferous to Permian deformation of the foreland fold-thrust belt in the southern Appalachian Valley and Ridge and Cumberland Plateau (Hatcher et al., 2007a; Hatcher, 2010). A master detachment fault was formed in the southern Appalachians along the ductile-brittle transition and eventually propagated from the basement into the Neoproterozoic to Cambrian rifted margin succession (Hatcher et al., 2007a). The overlying carbonate platform is mechanically stronger than the

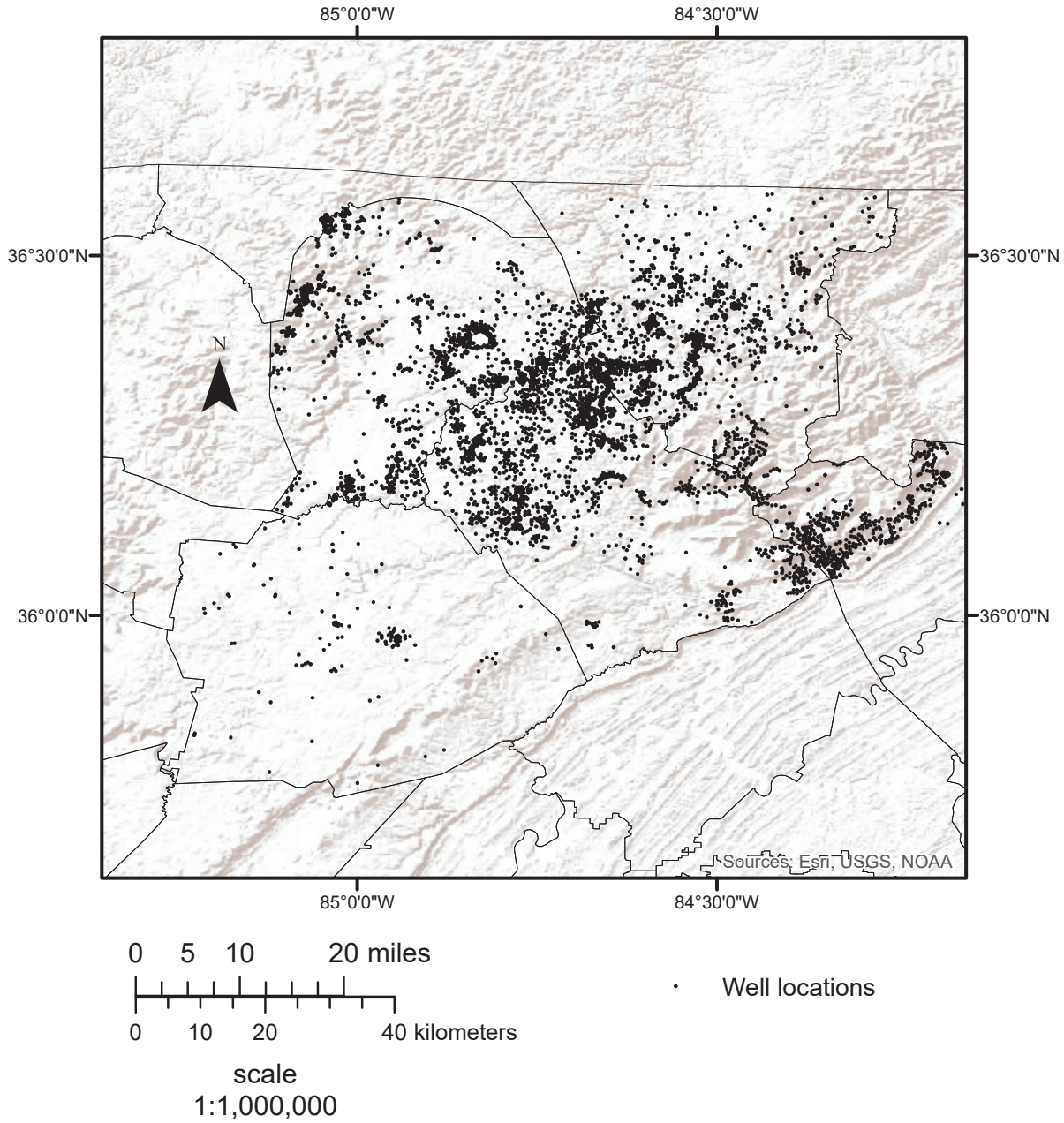


Figure 3-1. Locations of 4,596 oil and gas wells in Anderson, Cumberland, Fentress, Morgan, and Scott Counties.

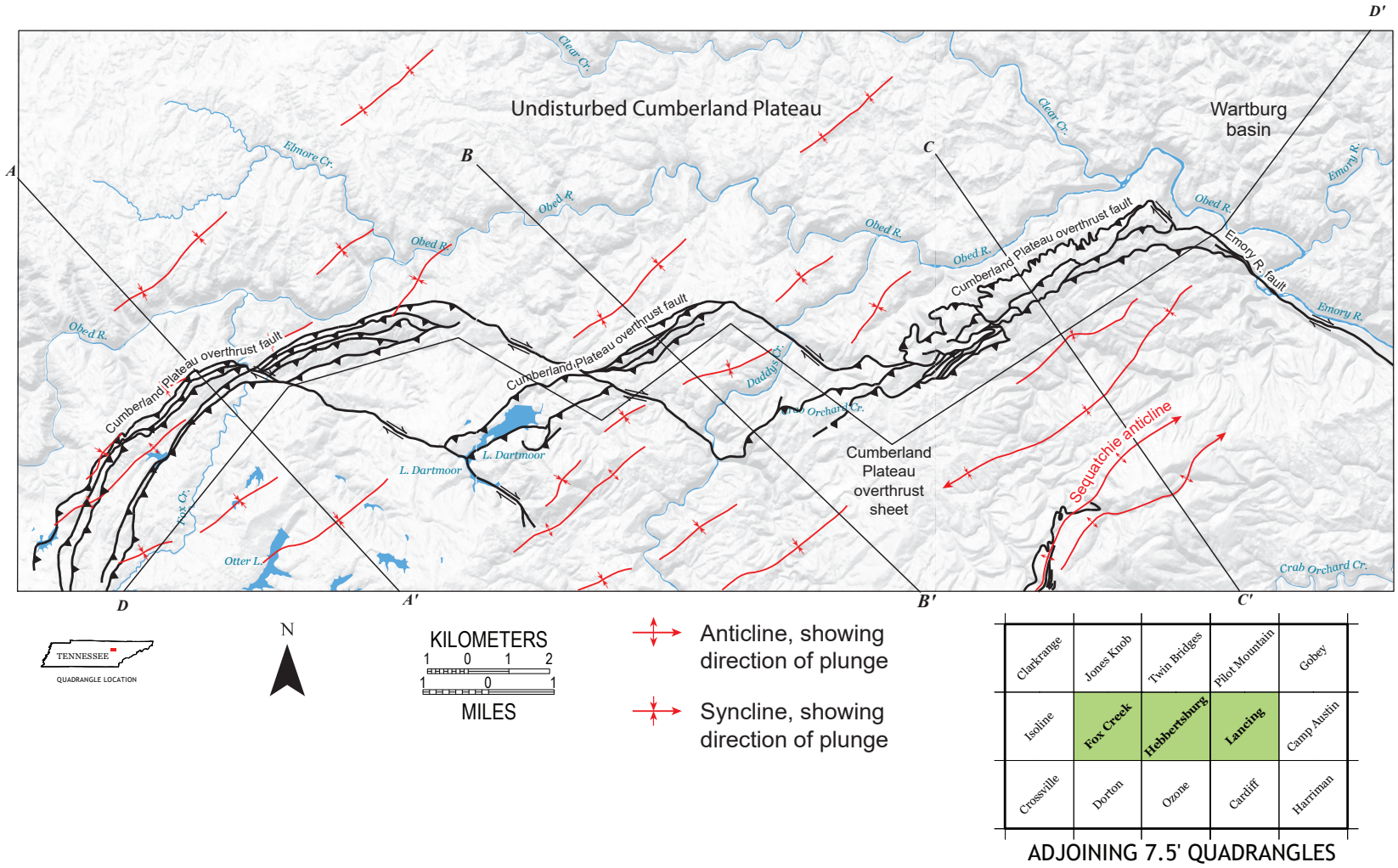


Figure 3-2. Tectonic map of field area with cross section lines. A-A′, B-B′, and C-C′ in Fig. 3-3 and Plate 2. D-D′ only on Plate 2.

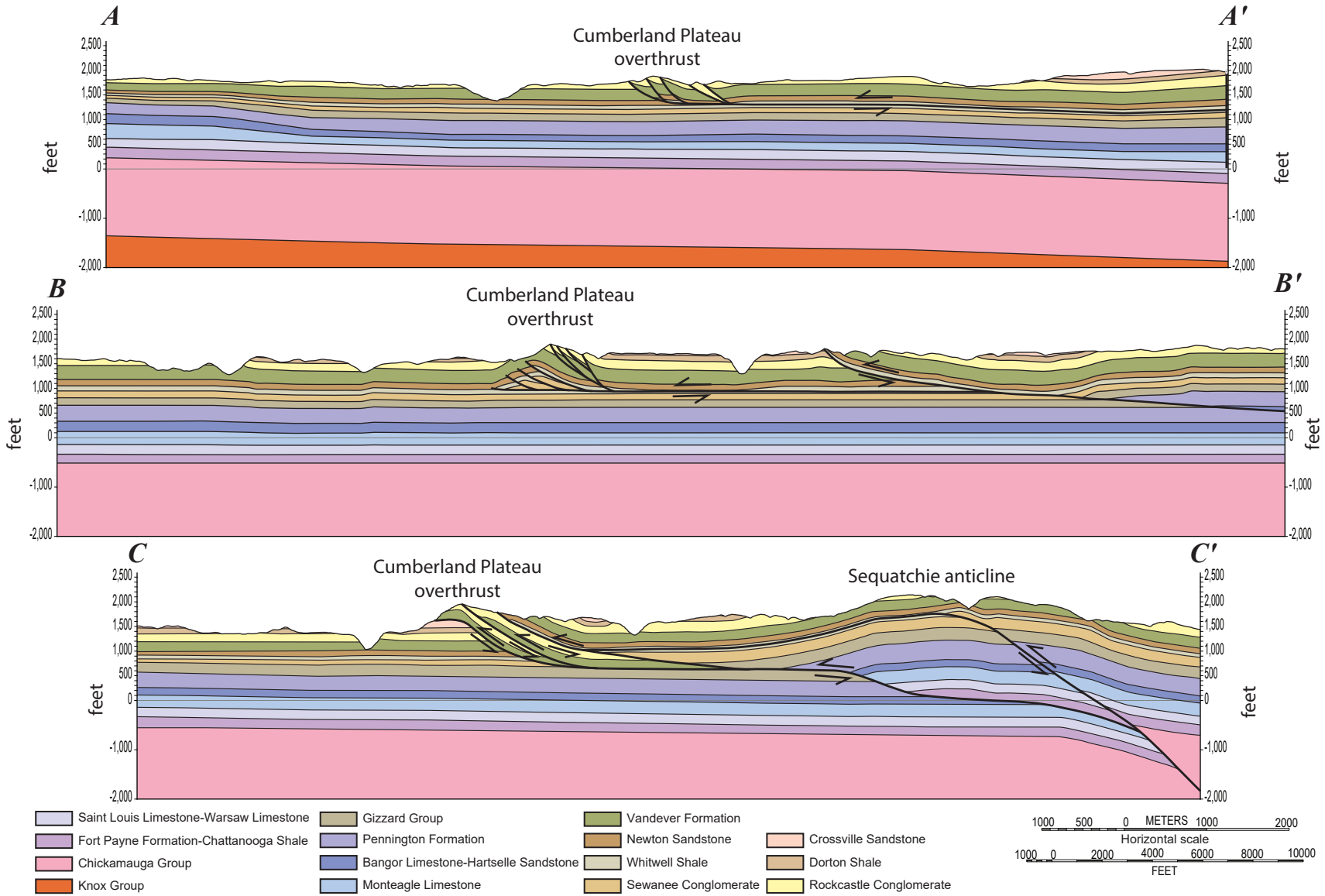


Figure 3-3. Cross sections A-A′, B-B′, and C-C′ locations on Fig. 3-2. Vertical exaggeration 2x.

Valley and Ridge master detachment in the comparatively weak shale and siltstone of the Rome Formation (Hatcher et al., 2007a).

West of the Valley and Ridge foreland fold-thrust belt in Tennessee, the Cumberland Plateau is affected by the Alleghanian only to the base of the Pine Mountain and Sequatchie Valley-Cumberland Plateau thrust sheets. These thrust sheets are much thinner than those of the Valley and Ridge, and they are mostly covered by nearly flat-lying Pennsylvanian clastic units. The Pine Mountain thrust sheet and the Cumberland Plateau overthrust sheet are underlain by the Pine Mountain thrust and the Sequatchie Valley-Cumberland Plateau overthrust fault systems, respectively, that have ramped from the master décollement in Cambrian Rome Formation beneath the Valley and Ridge and southeastern Plateau (Rich, 1934; Stearns, 1954; Milici, 1963; Harris and Milici, 1977).

Rich (1934) first recognized the thin-skinned nature of the Pine Mountain block, and contrasting strength of different lithologies has been shown to have a significant impact on deformation styles in a particular region (Woodward and Rutherford, 1987). Structural-lithic units, or lithotectonic units, are competent units that are bounded by relatively weak units and control the reaction of the entire package to deformation (Currie et al., 1962; Mitra, 1988). This concept, called mechanical stratigraphy, plays an important role in the geometry of faulting on the Cumberland Plateau.

The Appalachian Valley and Ridge has been shown to generally develop from the interior of the mountain chain outward to the west (Perry, 1978); therefore the Cumberland Plateau faults are likely the youngest Alleghanian-related faults in the Appalachians, forming sometime in the Permian. In this area, the youngest deformed rocks are lower Pennsylvanian, defining only a maximum age for deformation.

Mesoscopic structures

Bedding

Average strike of bedding in the field area is N47E, which is consistent with the regional strike of the Valley and Ridge but also includes influence from the Cincinnati arch (Fig. 3-4). The magnitude of dip is generally far less than that of the Valley and Ridge, ranging from nearly horizontal to ~20 degrees around the Sequatchie anticline and near thrusts to nearly vertical locally along the tear fault segments (Fig. 3-2). A distinct difference in structural style exists on either side of the Cumberland Plateau overthrust, with an Alleghanian signature on the overthrust sheet that is not present in the undisturbed portion of the Plateau in the field area (Figs. 3-5; 3-6). All of the sandstone units, especially the Rockcastle Conglomerate, contain prominent cross-bedding that can easily be mistaken for primary bedding in areas of limited exposure (Fig. 3-7). There is a direct correlation between bedding thickness and competency, with the more competent sandstone exhibiting thick to massive bedding, less competent sandstone exhibiting thin-medium bedding, and the weakest units being very thin-bedded shales. All of the sandstone units exhibit a wide variety of bedding, and beds in the sandstone units generally thin in the direction of younging resulting from the transgressive nature of the stratigraphy in this area.

Faults

As a result of most faults forming as bedding planes in poorly exposed shale, mesoscopic thrust faults were not recognized outside of one small-displacement fault with a fault-propagation fold in the Rockcastle Conglomerate near Daddy's Creek in the Hebbertsburg quadrangle (Fig. 3-8). Displacement on this fault is probably less than 10 cm.

Folds

Exposed mesoscopic folds are rare because deformation in this region occurred near the surface at low temperatures. There are a few buckle folds associated with apparent shortening of the Cumberland Plateau overthrust sheet. All of the exposed folds were near the trace of the

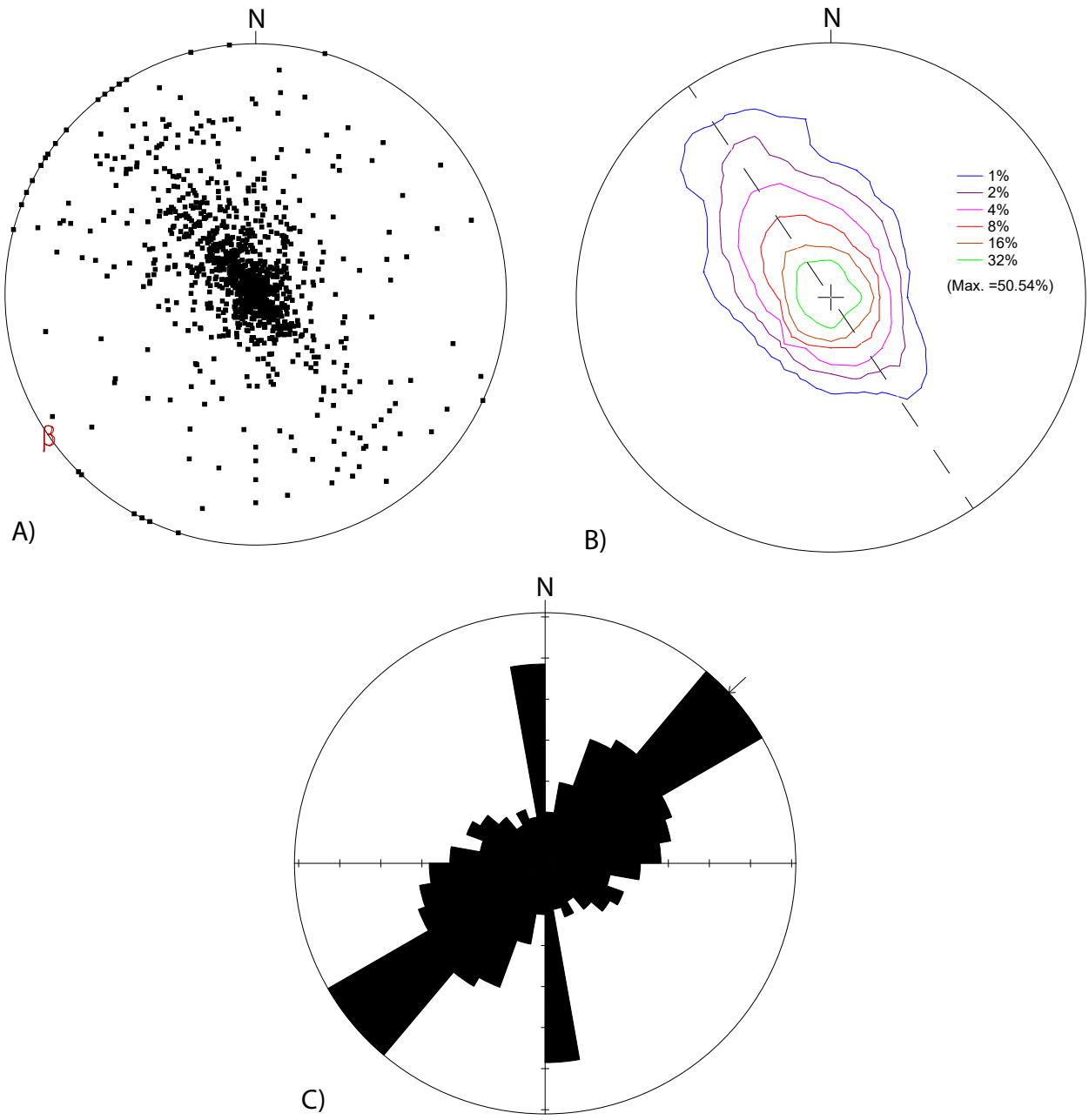


Figure 3-4. Lower hemisphere, equal-area projection of (A) 1,401 poles to bedding in the study area. Beta axis—S56W 0 SW. Bedding data include measurements by Rascoe (1951), Stearns, (1954), and Moore (unpublished). (B) Contoured data from (A). Contours represent density %/1% area. Calculated girdle shown with dashed line. (C) Rose diagram of strike direction from (A). There is a strong NE-SW mode with a minor N-S mode. Plots made using GEOrient v. 9.5.1 by Rod Holcombe (University of Queensland).

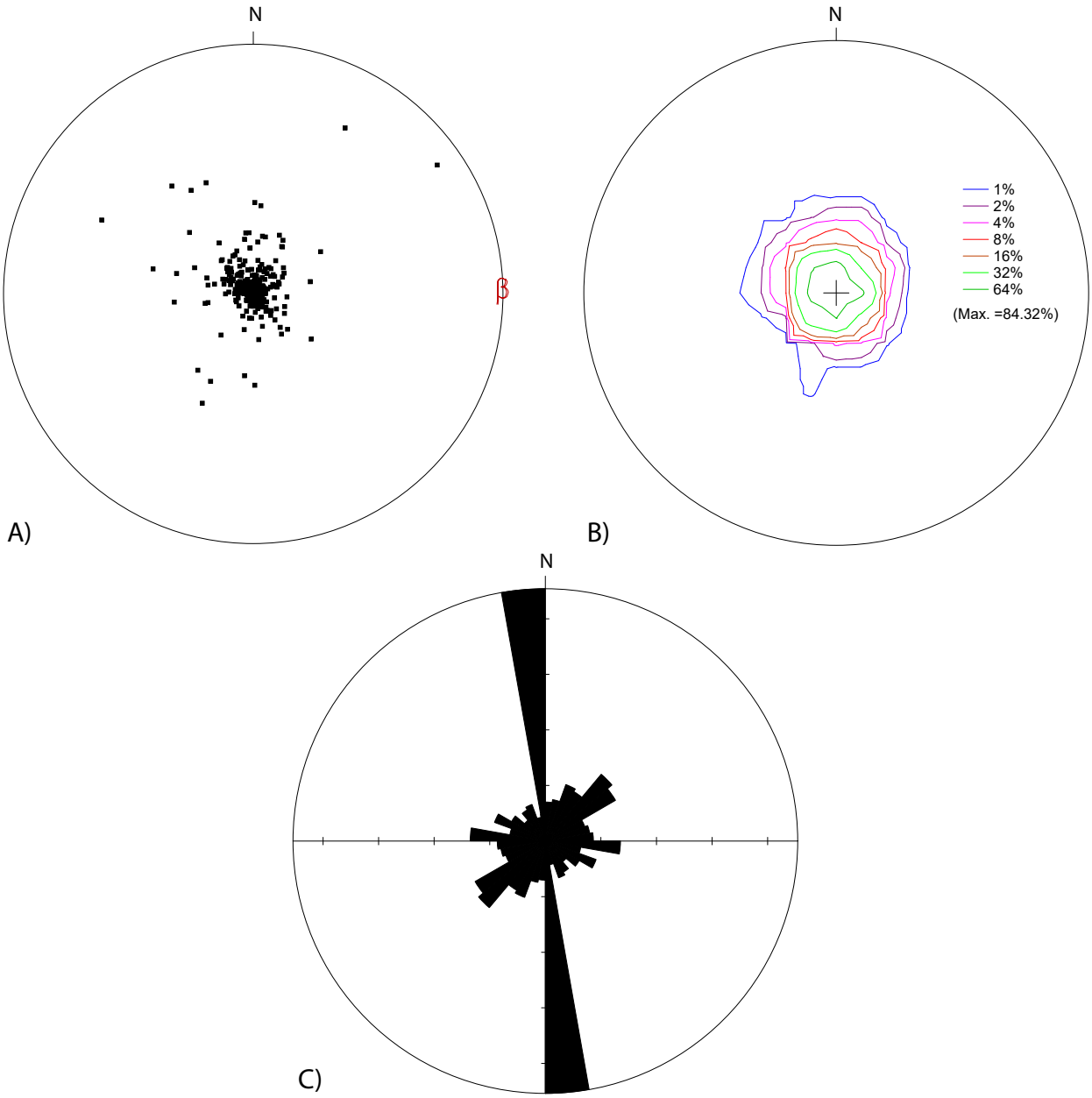


Figure 3-5. Lower hemisphere, equal-area projection of (A) 370 poles to bedding in the undeformed Cumberland Plateau in the study area. Beta axis—N88E 1 NE. Bedding in this area is subhorizontal. Bedding data include measurements by Rascoe (1951), Stearns, (1954), and Moore (unpublished). (B) Contoured data from (A). Contours represent density %/1% area. (C) Rose diagram of strike direction from (A). Primary strike mode is nearly north-south representing influence from the Cincinnati arch. Plots made using GEOrient v. 9.5.1 by Rod Holcombe (University of Queensland).

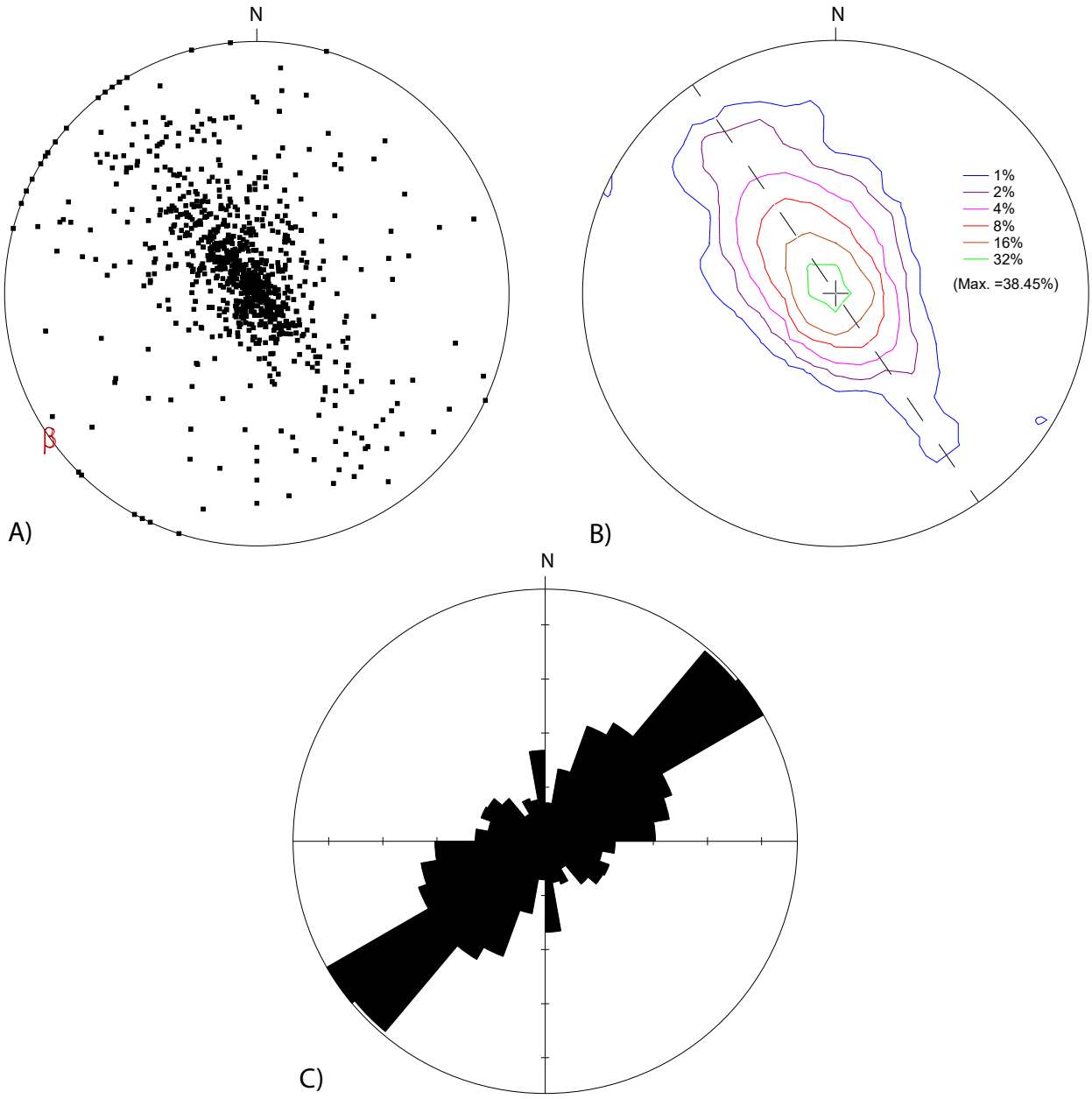


Figure 3-6. Lower hemisphere, equal-area projection of (A) 1,030 poles to bedding on the Cumberland Plateau overthrust sheet in the study area. Beta axis—S56W 0 SW. Bedding data include measurements by Rascoe (1951), Stearns, (1954), and Moore (unpublished). (B) Contoured data from (A). Contours represent density %/1% area. Calculated girdle shown with dashed line. (C) Rose diagram of strike direction from (A). NE-SW strike mode shows fold-thrust influence that is also present in Valley and Ridge. Plots made using GEOrient v. 9.5.1 by Rod Holcombe (University of Queensland).

Figure 3-7. Tabular planar, cross-bedded Rockcastle Conglomerate near the bank of Yellow Creek in the Hebbertsburg quadrangle. (Photo by Justin Rehrer).

Figure 3-8. Small fault-propagation fold in Rockcastle Conglomerate (above center in photo). Outcrop is near Cumberland Plateau overthrust outcrop at Mouth of Yellow Creek Ford. Hammer is ~12 in (30 cm).

Cumberland Plateau overthrust or the Emory River tear fault. Bedding, at least with a small sample size, defines the fold geometry. The more competent, thin- to medium-bedded sandstones tended to create larger open folds (Fig. 3-9, A), and the only kink fold was found in very thin-bedded shale (Fig. 3-9, B). Small, relatively tight folds were found in thin-bedded, weak siltstone and sandstone layers (Fig. 3-10).

All mesoscopic folds found near the trace of the Cumberland Plateau overthrust follow Pumpelly's rule which states that small scale features will generally approximate the trend of the larger features that they make up (Pumpelly et al., 1894). Folds found near the Emory River tear fault have axial surfaces roughly perpendicular to the tear fault. No mesoscopic folds were found in the footwall northeast and northwest of the Cumberland Plateau overthrust sheet.

Thin sections

At low temperatures or high strain rates, rocks change shape by brittle deformation; sliding on faults and fractures in the surrounding fault zone forms a volume of fault rock classified as gouge, cataclasite, and breccia (Passchier and Trouw, 2005). A cataclasite can be recognized in thin section by a large range in grain size, angular grain boundaries, and the presence of polycrystalline rock fragments (Blenkinsop, 1991; Passchier and Trouw, 2005). Quartz deformation can be affected by factors that include overburden pressure, strain-rate, and fluid pressure (Passchier and Trouw, 2005). However, at very low-grade conditions (<300° C) quartz deformation is generally accomplished through brittle fracturing, pressure solution, and transfer of material (Dunlap et al., 1997; van Daalen et al., 1999; Stipp et al., 2002).

Brittle deformation of quartz sandstone is apparent in thin sections from locations at the leading edge of the Cumberland Plateau overthrust, the Emory River tear fault, and along the axis of the Sequatchie anticline (Fig. 3-11, A-C). All of the cataclasite samples show grain size reduction along fractures with little displacement at the microscopic level. Composite grains of intragranular static and dynamic recrystallization inherited from higher temperature regimes are present. All transgranular deformation occurs through very low-grade mechanisms, primarily brittle fracturing.

(A)

(B)

Figure 3-9. Folding in the hanging wall of the Emory River tear fault. (A) Flexural-slip folding in Vandever Formation sandstone near Rock Creek campground along the Emory River. (Photo by Bryan Hansen.) (B) Crenulation folds in Vandever Formation shale at Nemo rapid. Hammer is ~12 in (30 cm).

Figure 3-10. Tight NE-plunging fold hinge in mixed shale and siltstone (center of photo) in upper Crossville Sandstone near outcrop of Cumberland Plateau overthrust in Lancing quadrangle. Hammer is ~10 in (26 cm).

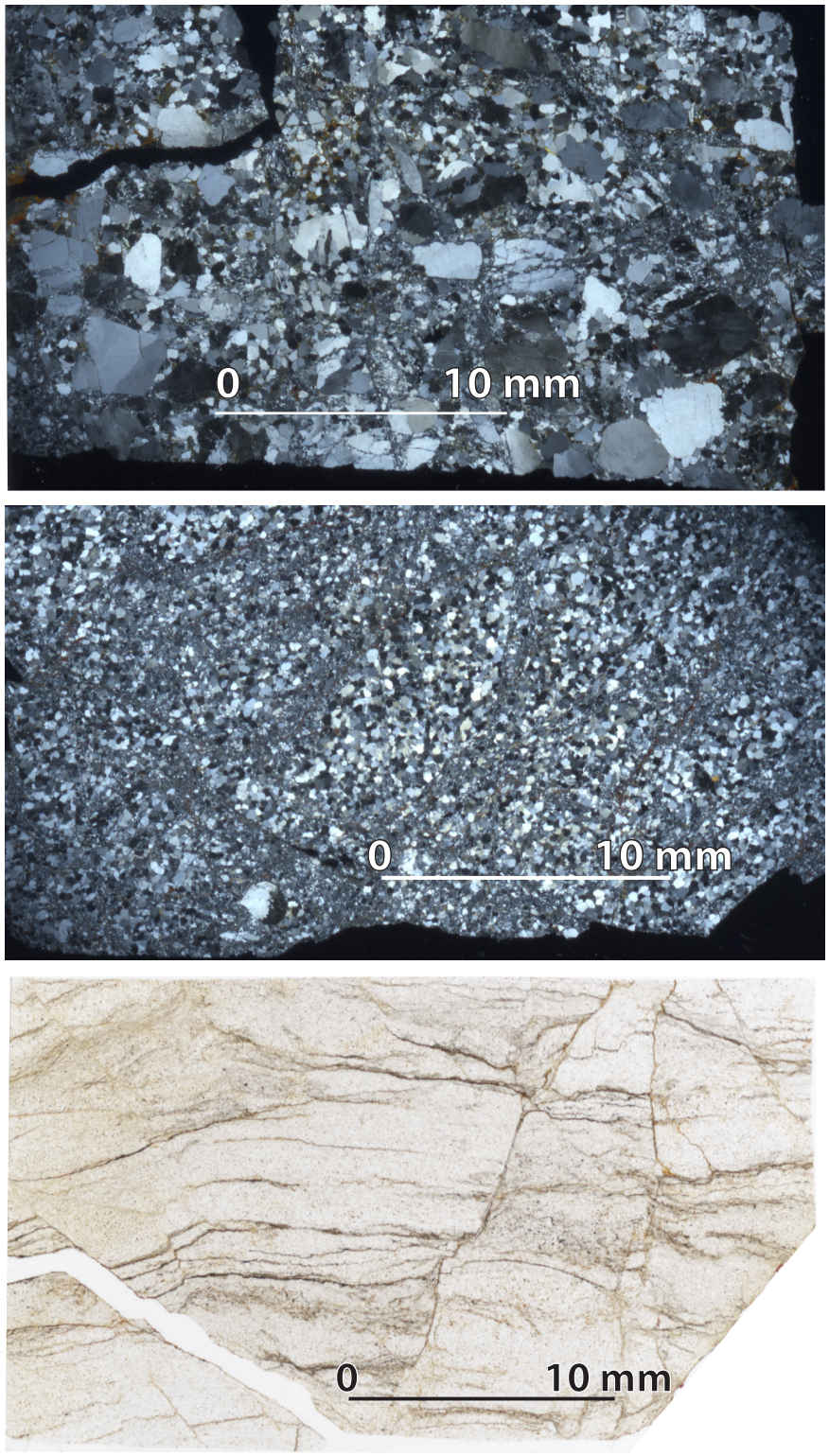


Figure 3-11. Thin sections from CPO sheet in Lancing quadrangle exhibiting low-temperature, brittle deformation in quartz-dominated clastics. (A) Newton Sandstone from CPO. (B) Highly fractured fine-grained Sewanee Conglomerate sandstone from crest of Sequatchie anticline. Grain size reduction from brittle deformation revealed. Cross polarized light in (A) and (B). (C) Fractured Vandever Formation siltstone from Emory River tear fault. Plane polarized light.

Cincinnati arch

The primary structural component of the undeformed portion of the Cumberland Plateau is a southeast dip of about 25 ft/mile (~5 m/km) off of the Cincinnati arch (Wilson and Stearns, 1958). The Cincinnati arch, including the Nashville dome, was formed during much of the Paleozoic as a direct consequence of the Appalachian orogenies (Wilson, 1935). Uplift occurred on this intracratonic arch in episodes associated with intervals of orogenic quiescence adjacent to the arch, combined with loading in regions of the orogen remote from the arch (Beaumont et al., 1988).

Cumberland Plateau structure

The Cumberland Plateau contains three structural subprovinces: (1) an area undeformed by faulting, including the Wartburg basin; (2) the Pine Mountain block; and (3) the Cumberland Plateau overthrust sheet. The Cumberland Plateau overthrust sheet and the Pine Mountain block are thin-skinned thrust sheets formed during the Alleghanian orogeny with their roots in the Valley and Ridge province to the southeast (Wilson and Stearns, 1958).

The area of detailed geologic mapping contains a portion of both the undeformed Cumberland Plateau and the Cumberland Plateau overthrust sheet. These two subprovinces are separated by the Emory River fault east of Hatfield Mountain in the Lancing quadrangle and by the Cumberland Plateau overthrust west of Hatfield Mountain in the Lancing, Hebbertsburg, and Fox Creek quadrangles.

Wartburg basin

The Wartburg basin is part of the structurally undeformed subprovince on the Cumberland Plateau. It is bounded by the Emory River tear fault to the southwest and the Jacksboro tear fault to the northeast, and on the southeast by Walden Ridge, the eastern escarpment of the Cumberland Plateau, where the Cumberland Plateau butts against the Valley and Ridge. The northwest boundary is less well-defined but is approximated by a line from the Cumberland Plateau overthrust at Hatfield Mountain to the Pine Mountain thrust near Elk Valley (Fig. 1-3).

The Wartburg basin is covered entirely by rocks ranging from lower to middle Pennsylvanian. The middle Pennsylvanian units of the Warburg basin— Slatestone, Indian Bluff, Graves Gap, Redoak Mountain, Vowell Mountain, and Cross Mountain formations— are not found on the Cumberland Plateau overthrust sheet, or in the area mapped in detail and represent some of the youngest rocks in East Tennessee.

The Wartburg basin is topographically higher than the surrounding area, reaching altitudes of over 3,000 ft (1,000 m) in places. However, the region is also structurally lower than both the Cumberland Plateau overthrust sheet and the Pine Mountain block because it has not been subjected to vertical or horizontal movement by thrust faulting.

Pine Mountain thrust system

The Pine Mountain thrust system is a classic example of thin-skinned fold-thrust belt geology (Stearns, 1958; Mitra, 1988). At the surface, the Pine Mountain thrust sheet is bounded by the Pine Mountain thrust to the northwest, Wallen Valley and Hunter Valley thrusts to the southeast, Jacksboro tear fault to the southwest, and the Russell Fork fault to the northeast (Rich, 1934; Mitra, 1988) (Fig. 3-12 A). The boundary between the Cumberland Plateau and the Valley and Ridge province is on the Pine Mountain sheet at the eastern escarpment of the Middlesboro syncline, and the northwestern limb of the Powell Valley anticline (Rich, 1934). The Powell Valley anticline of the Valley and Ridge is a ramp-related anticline exposing Cambrian to Mississippian rocks, while the rocks of the Middlesboro syncline are primarily Pennsylvanian (Wilson and Stearns, 1958). Displacement decreases on the leading edge of the thrust from 13.2 miles (21.3 km) at the intersection of the Jacksboro fault to less than 1.8 miles (3 km) at the intersection of the Russell Fork fault (Mitra, 1988). The Pine Mountain thrust sheet is underlain by the Pine Mountain fault as a bedding thrust with its roots in the Cambrian Rome Formation of the Valley and Ridge (Fig. 3-12, B). Mitra (1988) defined six lithotectonic units that played an important role in the deformation pattern of the Pine Mountain block. These are: (1) the Precambrian basement, which is generally not involved in thin-skinned deformation; (2) the Lower Cambrian Rome Formation and the Middle to Upper Cambrian Conasauga Group, consisting mostly of

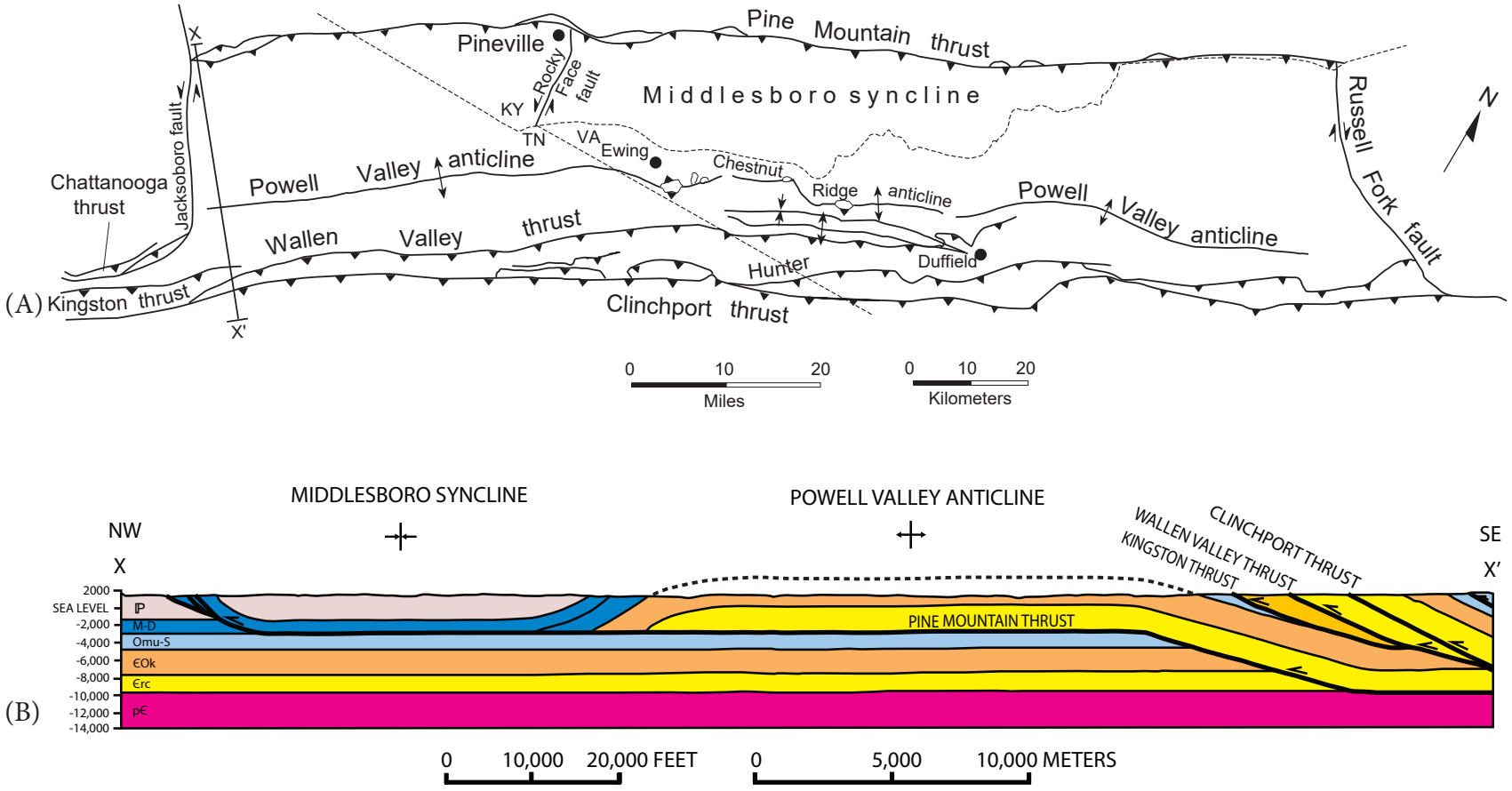


Figure 3-12. (A) Map view of Pine Mountain thrust. (B) Cross section X-X' showing geometry of Pine Mountain block. p€ (pink) = Precambrian. €rc (yellow) = Cambrian Rome and Conasauga. €Ok (orange) = Cambro-Ordovician Knox Group. Omu-S (light blue) = Middle Ordovican to Silurian. M-D (blue) = Devonian to Mississippian. * (light pink) = Pennsylvanian. (Both figures modified from Mitra (1988; (A)-his Fig. 1; (B)- his Fig. 4).

incompetent shale; (3) the Cambrian Maynardville Limestone and overlying Cambro-Ordovician Knox Group, consisting of relatively strong carbonate units; (4) Middle Ordovician Chickamauga Group, which consists of carbonate units that deform similarly to the Knox, but are more susceptible to folding and pressure solution; (5) an Upper Ordovician, Silurian, and Devonian heterogeneous sequence of thin-bedded shale units alternating with limestone and sandstone units; and (6) Mississippian and Pennsylvanian units consisting of mostly competent limestone and sandstone. Unit 5 includes the Mississippian-Devonian Chattanooga Shale that forms the upper detachment for the Pine Mountain thrust (Rich, 1934; Mitra, 1988).

Cumberland Plateau overthrust

The Cumberland Plateau overthrust sheet encompasses most of the southern Cumberland Plateau at the surface, including the Sequatchie anticline. With the exception of Sequatchie Valley, Crab Orchard Cove, and Grassy Cove, the Cumberland Plateau overthrust sheet is covered entirely by a Pennsylvanian sequence of alternating sandstone and shale. The Cumberland Plateau overthrust sheet is bounded to the north and west by the Cumberland Plateau overthrust— a complex series of thrust and tear faults extending across the Cumberland Plateau and southward into Alabama along the western Plateau escarpment. The northeastern boundary of the Cumberland Plateau overthrust sheet is the dextral Emory River tear fault.

The lithotectonic units involved in faulting of the Cumberland Plateau overthrust, with few exceptions, are similar to those underlying the Pine Mountain thrust (Mitra, 1988). The most important distinctions lie in the Upper Devonian-Pennsylvanian section. Lithotectonic units 1-4 defined my Mitra (1988) remain the same, but the main difference in the heterogeneous stratigraphy of unit 5 occurs in the Chattanooga Shale above a major unconformity (Milici, 1977; Woodward and Rutherford, 1987; Mitra, 1988) The Cumberland Plateau overthrust ramps through the competent Mississippian carbonate strata into the clastic Pennsylvanian sandstone and shale of the Cumberland Plateau. Here, the Cumberland Plateau overthrust crops out in a series of complex faults as flats in relatively thin shale units, and steeper faults formed in competent sandstone units. The Cumberland Plateau overthrust generally occurs in the thickest

of the shale units, the Vandever Formation, but commonly is exposed in the Rockcastle and occasionally in the Newton and Sewanee sandstone units. Bedding thrusts also lie beneath the Cumberland Plateau overthrust sheet in the shale and coal of the Gizzard Group.

The portion of the Cumberland Plateau overthrust, as well as the Emory River tear fault, which passes through the field area were points of emphasis for the detailed geologic mapping of this area (Fig. 3-2; Plate 1). In the study area, the maximum vertical displacement on the Cumberland Plateau overthrust sheet is ~600 ft (~150 m) along the Emory River fault at the boundary between the Lancing and Camp Austin quadrangles (Fig. 3-2; Plate 1). The vertical displacement can be estimated by the repeated contact between the Rockcastle Conglomerate and the Vandever Formation, which occurs at ~800 ft (~240 m) above sea level in the Emory River gorge and ~ 1,400 ft (~430 m) above sea level above the Emory River tear fault on the Cumberland Plateau overthrust sheet. The throw of the Cumberland Plateau overthrust gradually decreases from east to west to less than 100 ft in the Fox Creek quadrangle where the thrust superimposes Rockcastle Conglomerate on itself (Plate 1). Lack of structural windows or reliable markers indicating movement make determining heave difficult, but it has been estimated at approximately one mile (0.6 km) at the Emory River tear fault, diminishing to the southwest (Wilson and Stearns, 1958).

Illustrative outcrops of the Cumberland Plateau overthrust in the field area are rare because the fault often crops out in the poorly exposed shale of the Vandever Formation. Small cataclastic rock outcrops, or float in some cases, and a change in structural style to dips greater than 15° were used to determine proximity to faults. Changes in stratigraphy and topography were also used to determine fault location. Many of the thrust faults in the area result in relatively steep changes in topography and can be recognized on a topographic map. Tear faults of the Cumberland Plateau overthrust system do not present as topographic changes and the minimal throw made finding offset in contacts between units difficult. In some places, especially in the Hebbertsburg quad, streams tend to follow the tear faults, but this is only a general observation and not a ubiquitous

marker. In the southwest part of the Fox Creek quadrangle, one outcrop is conveniently located to reveal the Cumberland Plateau overthrust (Fig. 3-13).

Sequatchie anticline

The Sequatchie anticline is about 200 miles (300 km) long, extending from Blount County, Alabama, to Morgan County, Tennessee, where it terminates at the Emory River tear fault in the Lancing quadrangle (Wilson and Stearns, 1958) (Fig. 3-14). This anticline is distinguished by a topographic valley underlain by strata of the Lower Ordovician Knox Group and flanked by Pennsylvanian sandstone for much of its length (Milici, 1963). The Sequatchie anticline is asymmetrical for most of its length, and dips much more steeply on the western limb than on the eastern limb (Milici, 1963). This pattern holds true in the area mapped as well; bedding on the eastern limb dips generally <15° southeast, whereas bedding on the western limb dips 10°-30° northwest. In the mapped area, the Sequatchie anticline is a northeast-plunging anticline and exposes the Sewanee Conglomerate and small outliers of Gizzard Group near the fold hinge in the Crab Orchard Mountains.

The beta axis of the fold in the study area, determined from 196 structural measurements, plunges 3° NE at N33E (Fig. 3-15, A-C), which is close to the estimates of Milici (1963) for the northern portion of the anticline, which plunges 5-10° at N20E to N30E. The average strike of the Sequatchie anticline in the field area is N38E (Fig. 3-15, C). The northern terminus of the Sequatchie anticline is the largest structure present in the Cumberland Plateau overthrust sheet in the mapped area. Small displacement thrust faults were observed along the hinge of the Sequatchie anticline and interpreted as branches of the Sequatchie Valley-Cumberland Plateau overthrust fault system. Using down-plunge projection, the surface faults of the Sequatchie anticline were incorporated in cross section C-C′ through Lancing quadrangle (Figs. 3-2; 3-3; Plate 2). This relationship in cross section reinforces the idea, first suggested by Milici (1963), that the Sequatchie Valley-Cumberland Plateau overthrust fault system is a single genetically related system, rather than two discrete faults.

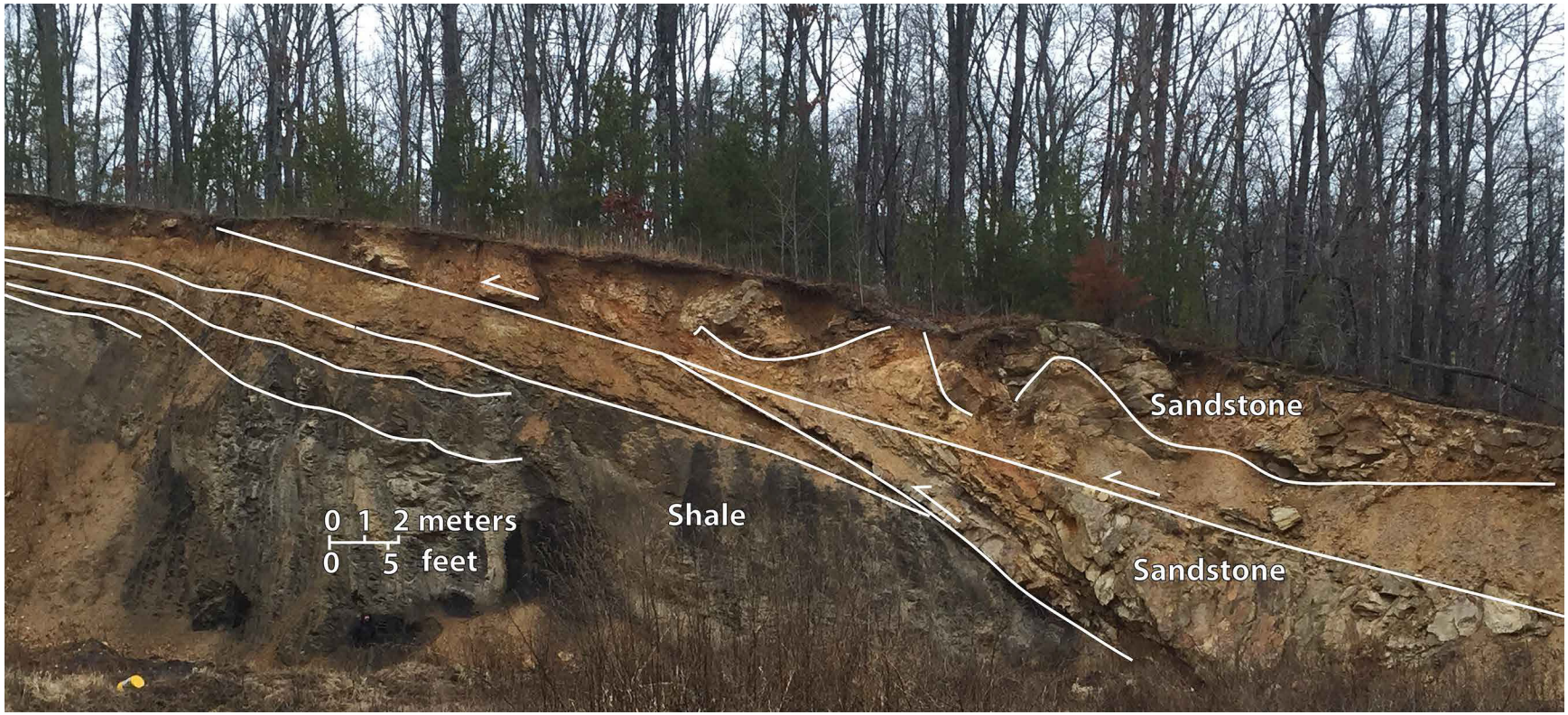


Figure 3-13. Outcrop of CPO in Fox Creek quadrangle. Sandstone and shale units interpreted to be members of Rockcastle Conglomerate. Cataclasite from deformed rocks in fault typical of that found near fault zones in other localities. Slickenlines on surface to left of photo show dip-slip motion**.**

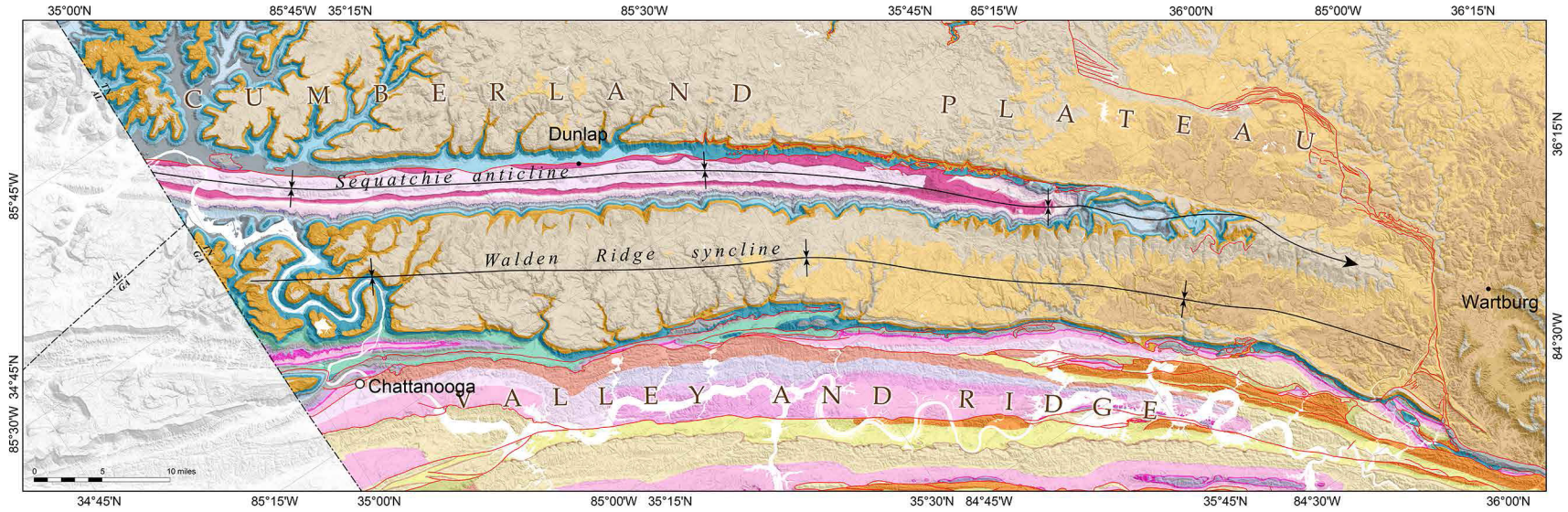


Figure. 3-14. Simplified geologic map of Sequatchie anticline in Tennessee. Orange-brown = Cambrian rocks. Pink, red, and lavender = Ordovician and Silurian rocks. Light blue = Mississippian carbonate rocks. Tan and orange = Pennsylvanian rocks of the Cumberland Plateau. Red lines = surface faults of the Valley and Ridge, Sequatchie Valley fault, and Cumberland Plateau overthrust. Modified from Hatcher and Milici (205) their Fig. 4-B. Geology from (Hardeman, 1966).

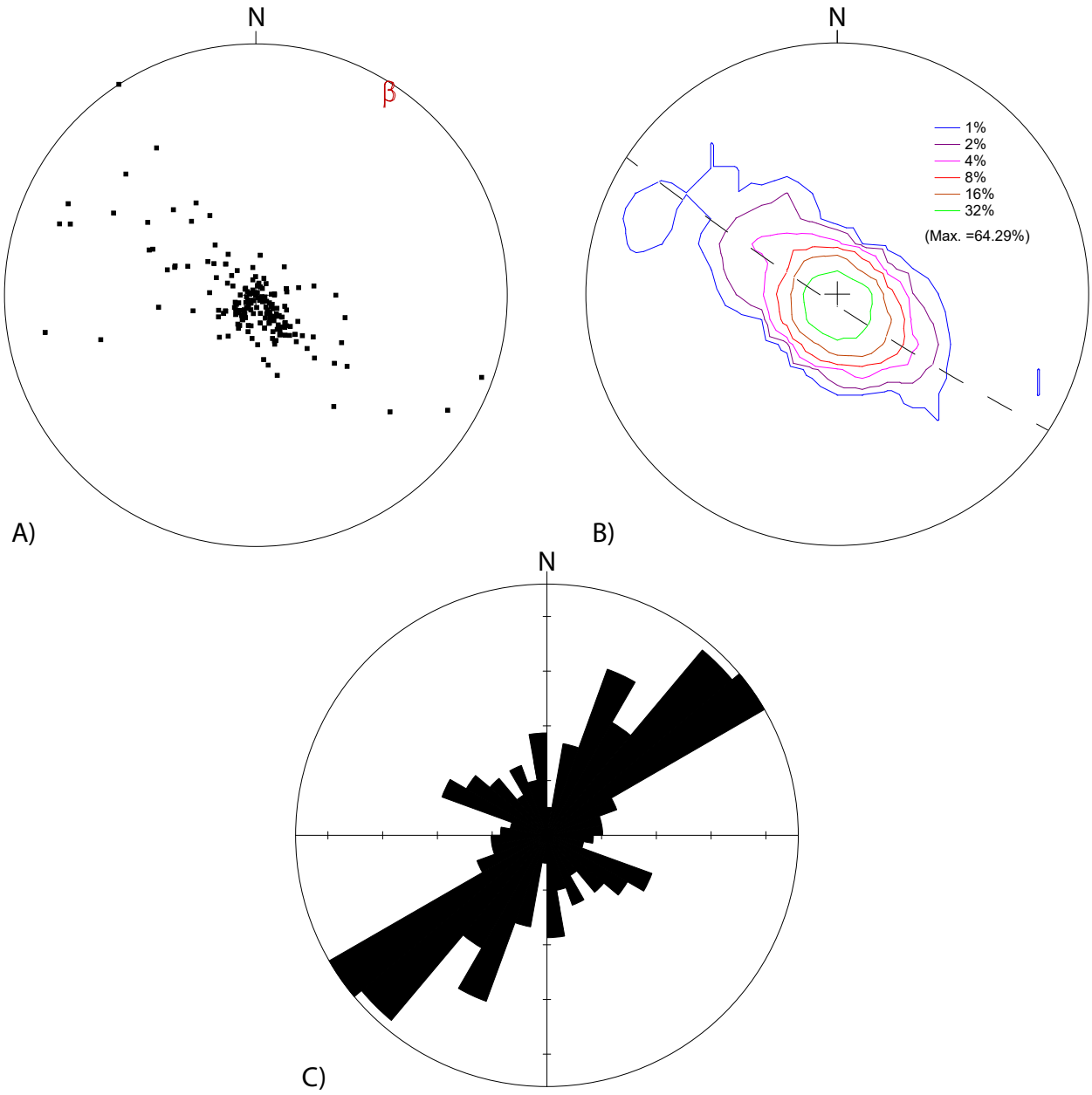


Figure 3-15. Lower hemisphere, equal-area projection of (A) 196 poles to bedding from the northern terminus of Sequatchie anticline in the study area. Beta axis— N33E 3 NE. Structural measurements show that the Sequatchie anticline is plunging 3° to the NE. Bedding data include measurements by Moore (unpublished). (B) Contoured data from (A). Contours represent density %/1% area. Calculated girdle shown with dashed line. (C) Rose diagram of strike direction from (A). NE-SW mode shows Valley and Ridge foreland-fold-thrust belt influence. Plots made using GEOrient v. 9.5.1 by Rod Holcombe (University of Queensland).

Cumberland Plateau overthrust sheet- Pine Mountain thrust sheet comparison

Both the Cumberland Plateau overthrust sheet and Pine Mountain block are thin-skinned thrust sheets in the Cumberland Plateau with roots in Valley and Ridge province to the southeast. In both cases the master décollement of the Valley and Ridge foreland fold-thrust belt ramped through Cambrian to Silurian carbonate strata beneath these thrust sheets. The major difference in thrust geometry reflects in the differing stratigraphic thickness of the Devonian-Mississippian Chattanooga Shale (Fig. 3-16). Thick weak units will localize and control deformation in an area while thin weak units will take on the character of the surrounding competent rocks (Woodward and Rutherford, 1987). The Chattanooga Shale is relatively weak compared to the surrounding carbonate units, and therefore acts as a lithotectonic unit boundary where it exceeds ~60 feet (20) (Woodward and Rutherford, 1987).

Where the Pine Mountain thrust propagated to the Chattanooga Shale in the subsurface, the shale is 100-200 ft (30-60 m) thick and acts as an effective upper décollement similar to the Cambrian Rome Formation in which the fault originated (Rich, 1934; Mitra, 1988). The fault, therefore, outcrops in the Chattanooga Shale with relatively little deformation of the overlying Mississippian carbonate and Pennsylvanian clastic rocks of the Middlesboro syncline. Since the décollement in the Chattanooga Shale is sufficient to absorb all of the motion of the Pine Mountain block, the fault forms a “clean” edge with the Jacksboro tear fault intersecting the Pine Mountain thrust at approximately a 90° angle. The thickness of the Chattanooga Shale under the Cumberland Plateau overthrust however sheet averages approximately 30 ft (10 m) and is too thin to act as an effective upper detachment for the Cumberland Plateau overthrust. The Cumberland Plateau overthrust therefore propagated from the Cambrian Rome Formation into the upper Ordovician-Mississippian carbonate and shale lithologies of lithotectonic unit (4) defined by Mitra (1988). It is likely that the fault flattens in the Chattanooga Shale but not for a significant distance before propagating through the Mississippian carbonate sequence and into the lower Pennsylvanian sandstones and shales in the Cumberland Plateau. Subsurface and surface mapping shows that west of the Sequatchie anticline there must be an upper detachment in the

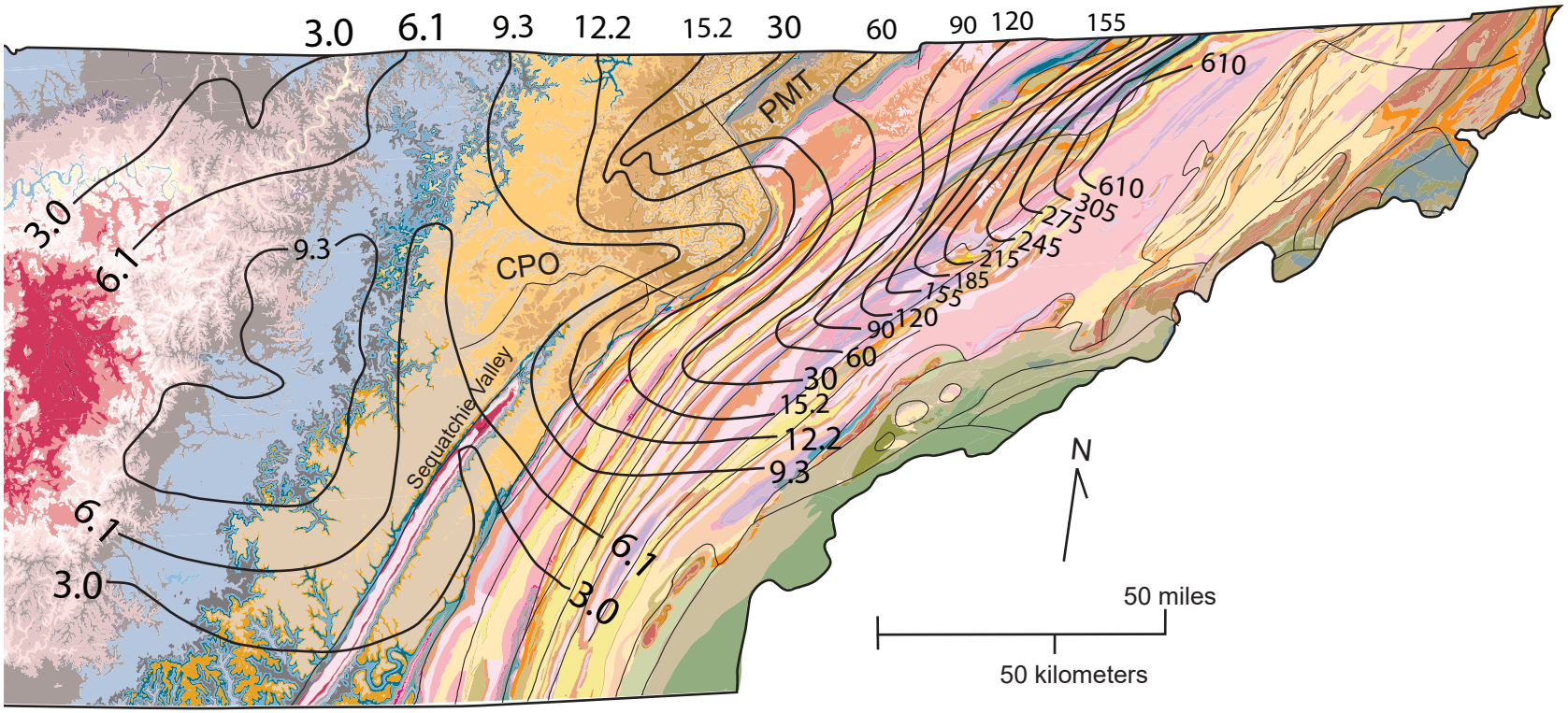


Figure 3-16. Isopach map in meters showing increase in thickness of MDc northeast. Beneath the Cumberland Plateau overthrust MDc thickness less than 6.1-9.3 m. Below the Pine Mountain thrust MDc thickness 30-60 m. Green = Pre-Cambrian rocks. Orange-brown = Cambrian rocks. Pink, red, yellow, and lavender = Ordovician and Silurian rocks. Blue and gray = Mississippian carbonate rocks. Tan and orange = Pennsylvanian sandstone and shale. Isopach data modified from Milici et al. (1979, their Fig. 6). Geology from (Hardeman, 1966).

lower part of the Pennsylvanian section (Woodward and Rutherford, 1987), likely within the coal and shale facies and of the Gizzard Group (Fig-3-2; Plate 2). Outcropping in a series of relatively thin sandstones (strong units) and shales (weak units) with small detachments in the shale and ramps in the sandstone results in the complex geometry of short thrusts and tear faults in the Cumberland Plateau overthrust as opposed to the straight trace of the Pine Mountain thrust.

STRUCTURE OF NORTHERN CUMBERLAND PLATEAU SUBSURFACE

Subsurface mapping

Subsurface maps were created by interpolating data from well logs generated by the oil and gas industry. All of the wells for which data were available in Cumberland, Morgan, Scott, Fentress, and Anderson Counties in Tennessee were used for this study (Fig. 3-1). This totaled 4,596 wells, 1,199 that were picked individually for this study, and the remaining well log data came from a data set that was used for larger-scale subsurface maps by Evenick (2006). All of the wells are located in the Cumberland Plateau. Using primarily gamma ray and density logs, the tops of the Middle Ordovician Deicke bentonite, Devonian-Mississippian Chattanooga Shale, Mississippian Fort Payne Formation, and Mississippian Warsaw Limestone were identified.

For each subsurface map, the well log picks were interpolated with empirical Bayesian kriging using ArcGIS software to create a predicted surface for structure contour maps. Kriging is a statistical technique for optimal spatial prediction that uses a semivariogram—a function of the distance and direction separating two locations—to quantify spatial dependency in the data (Krivoruchko, 2012). Empirical Bayesian kriging differs from other kriging methods by using many semivariogram models rather than only one (Krivoruchko, 2012). This accounts for the error introduced by estimating the semivariogram model (Krivoruchko, 2012).

In order to see more detail on the predicted surface, trend surface residual anomaly (TSRA) maps were made using global polynomial interpolation to create a first-order surface approximating regional structure. This first-order surface was then subtracted from the structure contour surface using ArcGIS raster math. The purpose creating trend surface residual anomaly

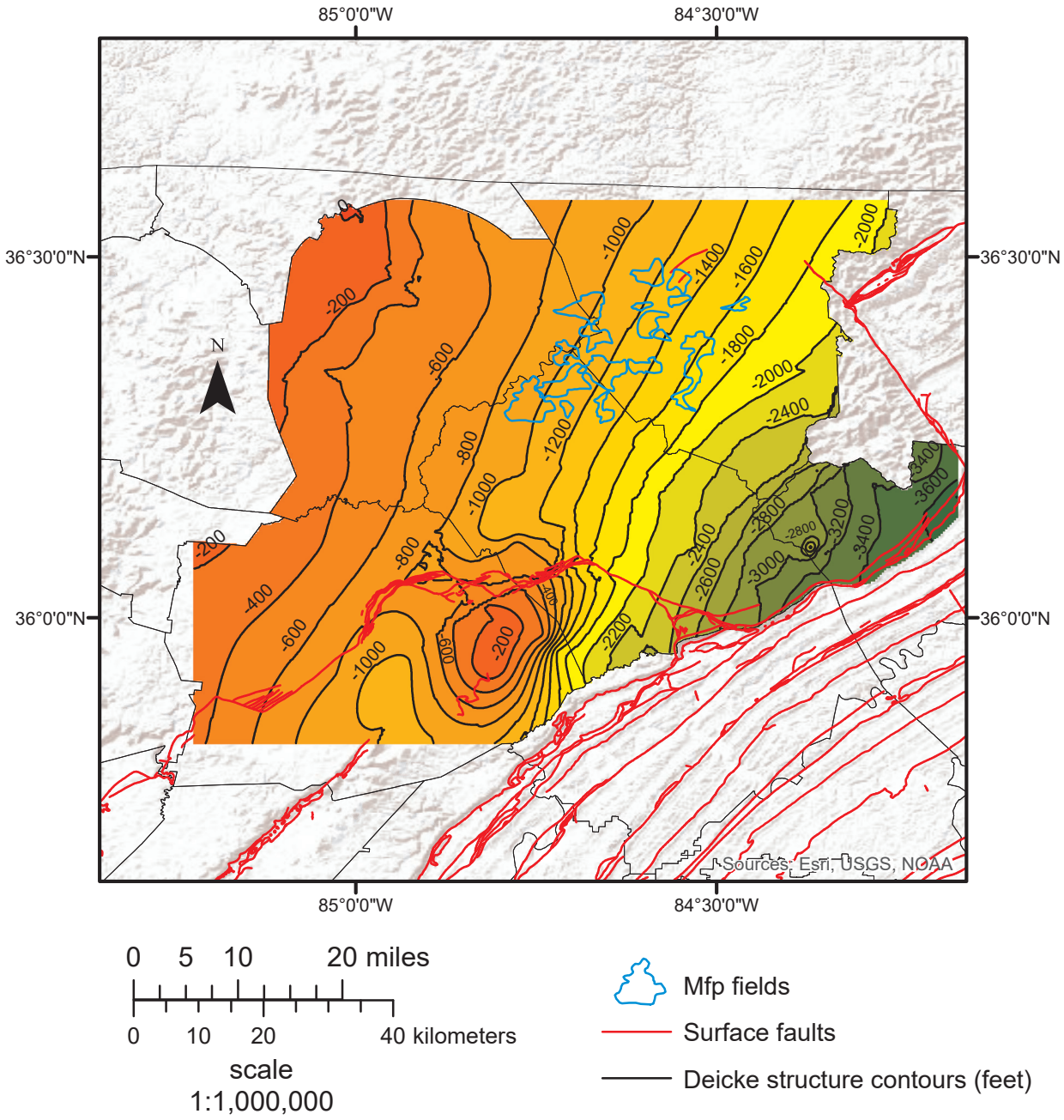


Figure 3-17. Structure contours on Ordovician Deicke bentonite interpolated from 410 wells using ArcGIS. Carbonate mounds located ~1,200 ft above relatively homoclinal ramp. Displacement of Sequatchie Valley-Cumberland Plateau overthrust system at depth revealed in southern part of figure. Well data from Evenick (2006) are incorporated. Contour interval 200 ft.

maps is to reduce the data range to enhance visibility of structures unrelated to regional dip (Evenick, 2008).

Ordovician Deicke bentonite

The widespread Deicke bentonite layer was contoured as a datum below the pre-Chattanooga Shale unconformity (Fig. 3-17). The most important structural features of this layer revealed by the interpolated structure-contour map are (1) a dip of 0.74° (~68 ft/mile; 13 m/km) at S72E and (2) the Sequatchie Valley fault-Cumberland Plateau overthrust system. The regional SE dip has been removed in the trend surface residual anomaly (TSRA) map in Fig. 3-18. The structural influence of the Sequatchie Valley fault is apparent in the relationship between the Deicke bentonite and the post-Devonian rocks. The Chattanooga Shale-Deicke bentonite isopach map maintains a consistent increase in thickness to the SE (Fig. 3-19).

Mississippian-Devonian Chattanooga Shale

The interpolated structure contour (Fig. 3-20) and TSRA (Fig. 3-21) maps of the Mississippian-Devonian Chattanooga Shale generally resemble that of the Deicke bentonite. The most important structural features are the Sequatchie Valley fault and a dip of 0.6° (~54 ft/mi; ~11 m/km) at S58W. The difference of 10 feet/mile (1.8 m/km) in regional dip from that of the Deicke bentonite reflects the thickening shown in Fig. 3-19 from ~600 ft (180 m) in northwest Fentress County to ~1,350 ft (410 m) in Anderson County beneath the eastern escarpment of the Cumberland Plateau.

The saddle in the Cumberland Plateau is interpreted to reflect a fault. A fault dipping only 4.1° to the southeast would account for the change in elevation of the surface of the Chattanooga Shale. A gentle anticline that is not apparent before the regional dip is factored out is present northwest of the Wartburg basin (Fig. 3-21).

Mississippian Fort Payne Formation

The Fort Payne Formation exhibits a regional dip of ~0.65° (~60 ft/mi; 11 m/km) at S58E. This unit is also elevated as part of the Sequatchie Valley fault-Cumberland Plateau overthrust

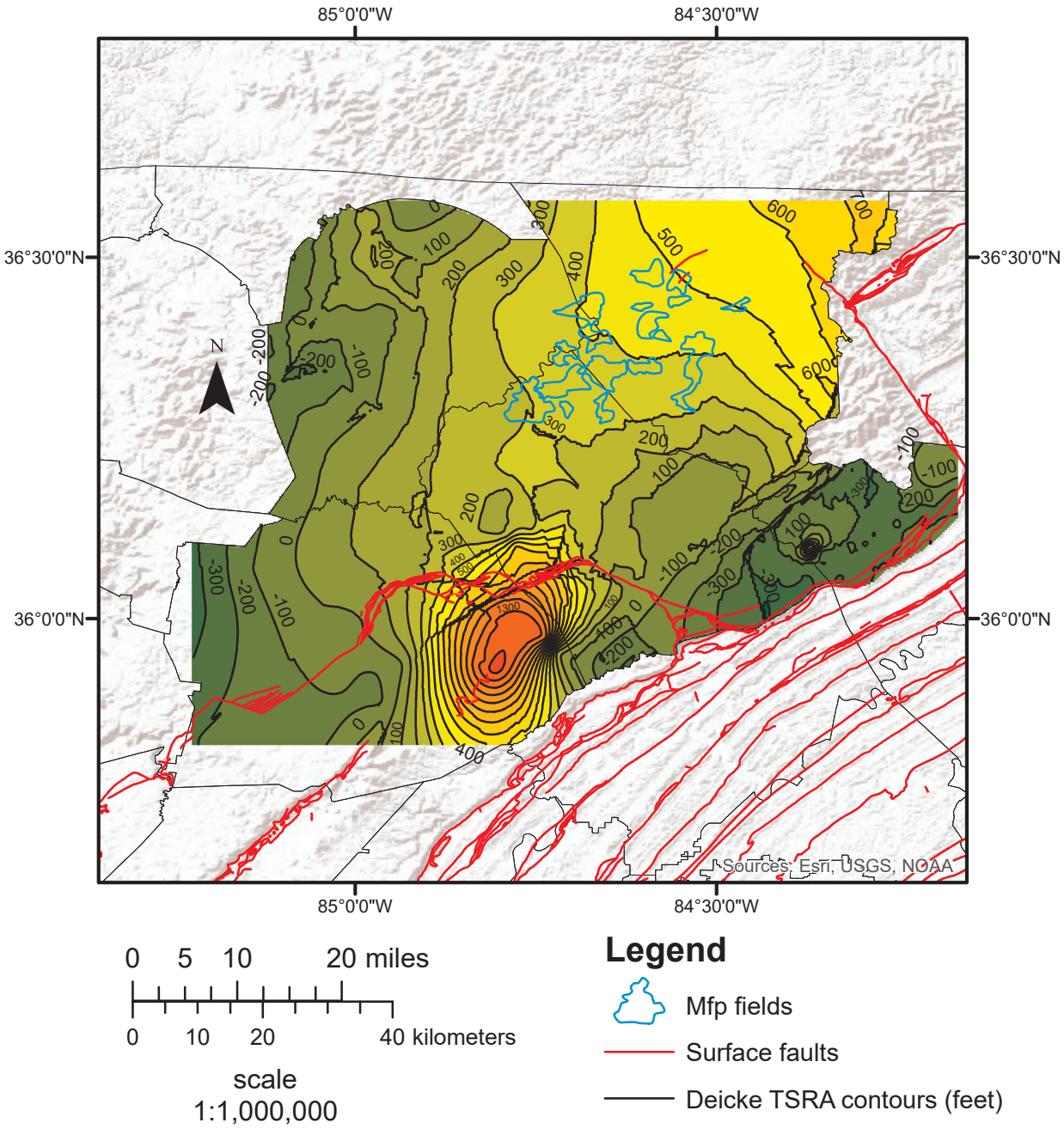


Figure 3-18. Trend surface residual anomaly (TSRA) contours on Ordovician Deicke bentonite interpolated from 410 wells using ArcGIS. Open, SW-dipping anticline below Fort Payne carbonate mounds. Well data from Evenick (2006) are incorporated. Contour interval 100 ft.

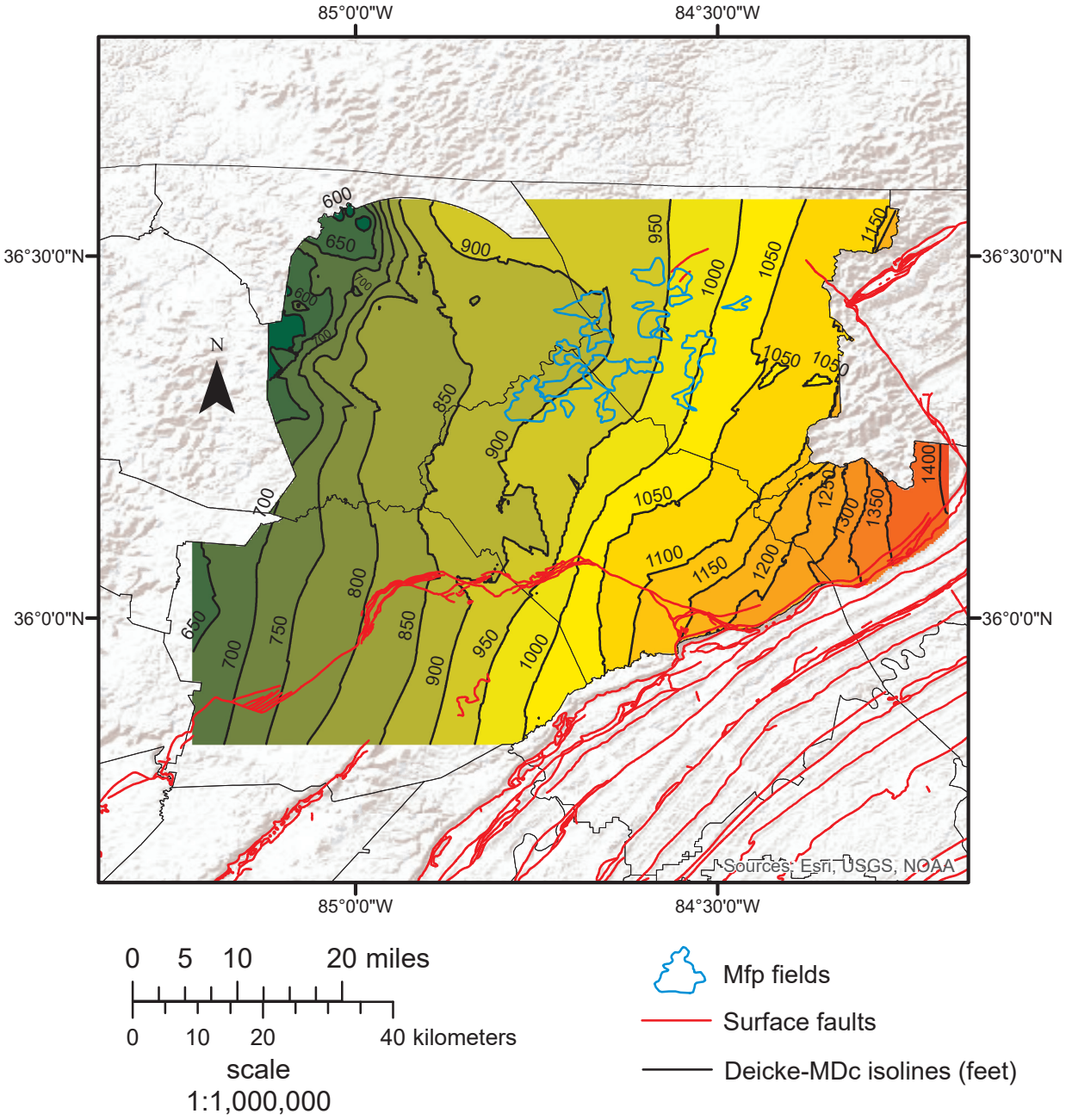


Figure 3-19. Isopach map showing thickness from top of Devonian-Mississippian Chattanooga Shale to top of Ordovician Deicke bentonite interpolated from 392 wells using ArcGIS. Uniform increase in thickness to SE reflects the greater dip of the Deicke bentonite compared to the Chattanooga Shale. Well data from Evenick (2006) are incorporated. Contour interval 50 ft.

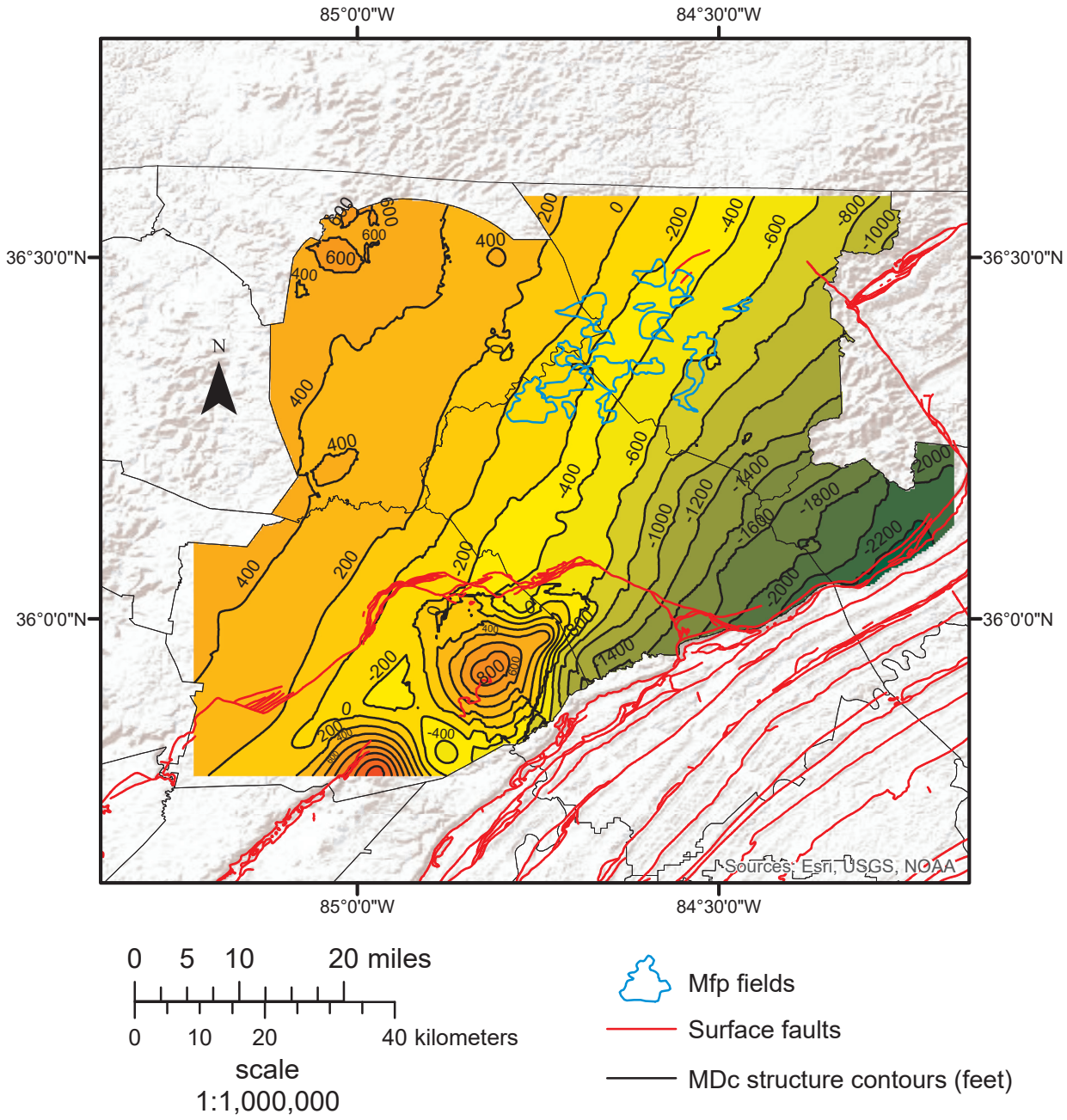


Figure 3-20. Structure contours on Devonian-Mississippian Chattanooga Shale interpolated from 2,855 wells using ArcGIS. Carbonate mounds located over homoclinal ramp. Displacement from Sequatchie Vally-Cumberland Plateau overthrust system reflected by structurally high surface in southern part of figure. Well data from Evenick (2006) are incorporated. Contour interval 200 ft.

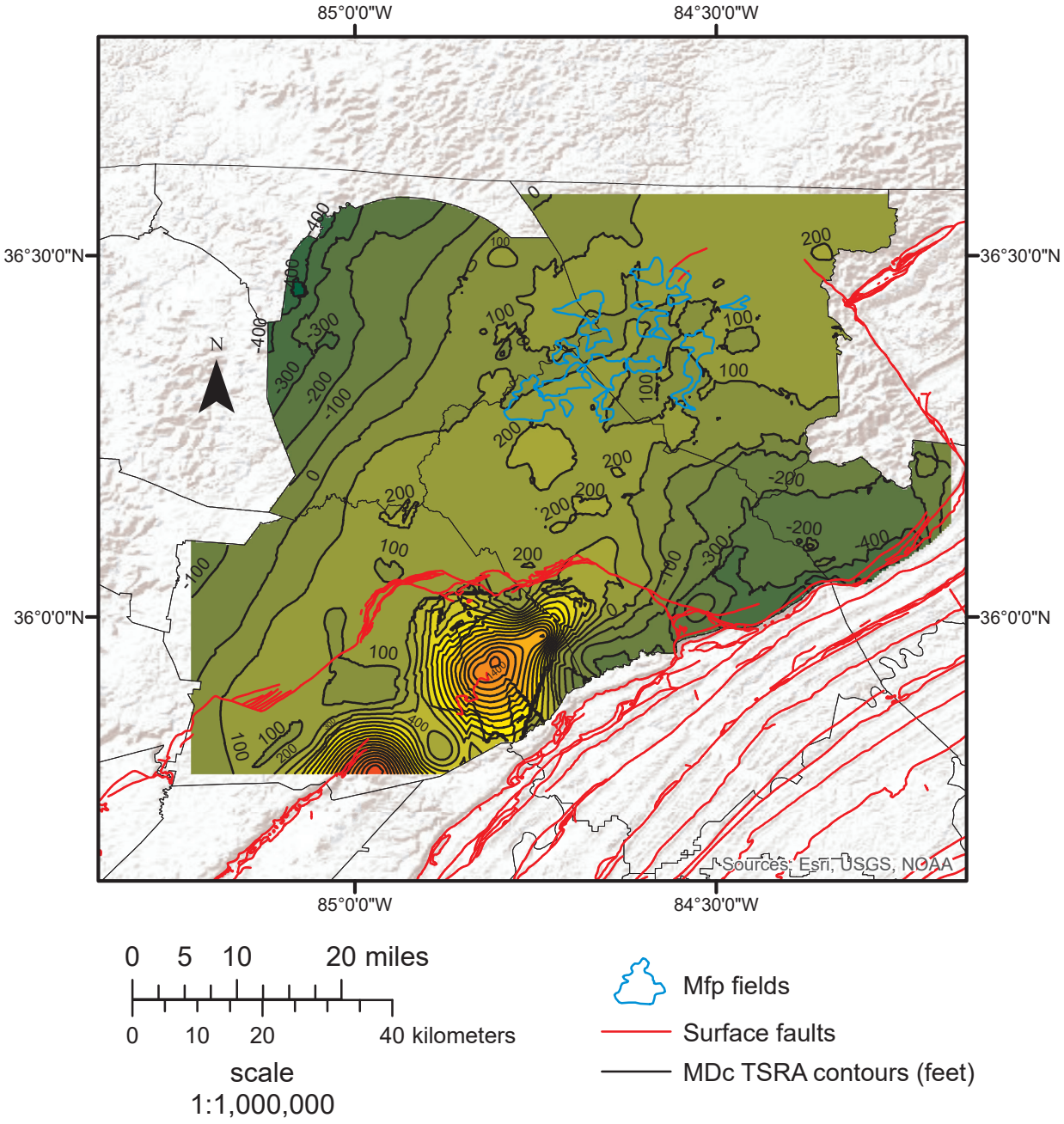


Figure 3-21. TSRA contours on Devonian-Mississippian Chattanooga Shale interpolated from 2,855 wells using ArcGIS. A broad anticline NW of the Wartburg basin is revealed. A saddle with along-strike linear features present below Fort Payne carbonate mounds. Well data from Evenick (2006) are incorporated. Contour interval 100 ft.

system south of the Cumberland Platea overthrust fault (Fig. 3-22). Displacement is shown a little farther northeast toward the Emory River fault than the lower units, as the thrust sheet thins toward its boundary with the steeply dipping dextral tear fault. With regional dip removed, a gentle anticline roughly parallel to regional dip can be identified just northwest of the Wartburg basin (Fig. 3-23). A Fort Payne Formation isopach map shows thickening below the Sequatchie anticline (Fig. 3-24).

Upper Fort Payne carbonate mounds

The primary goal of contouring subsurface stratigraphic surfaces in the mapped area was to correlate structural trends with the placement of Waulsortian-like carbonate mounds of the upper Fort Payne Formation. Other carbonate mounds of similar age, composition, and morphology have been found in basin, shelf, intrashelf basin, shelf platform, and ramp settings (Bridges et al., 1995). The Ordovician Deicke bentonite, the Devonian-Mississippian Chattanooga Shale, and the Fort Payne Formation were contoured from well data using empirical Bayesian kriging in ArcGIS. The extent of 17 carbonate mounds in Fentress, Morgan, and Scott Counties were traced by sorting well logs in the area and selecting only those from fields known to produce from upper Fort Payne carbonate mounds (Table 3-1). The approximate size and shape of the mounds can be determined, although this method is not a perfect representation of their extent. For example, there is minor overlap of outlined fields suggesting that some well logs were incorrectly assigned to a particular field. It is also possible that some fields could contain more than one discrete mound.

In an area 195 mi^2 (505 km^2), 17 productive oil fields cover an average of 3.5 mi^2 (9 km^2) for a total of 60 mi^2 (155 km^2). All of the fields occur in the portion of the Plateau that is mostly undisturbed by surface faults. The southeastern boundary of the mounds generally shares the northwest boundary of the Wartburg basin. By mapping several subsurface units, some basic structural relationships can be determined in relation to the carbonate mounds.

The elevation of the Middle Ordovician Deicke bentonite below the carbonate mounds decreases from ~800 to ~1800 ft (240-550 m) below sea level (Fig. 3-17). The slope is relatively

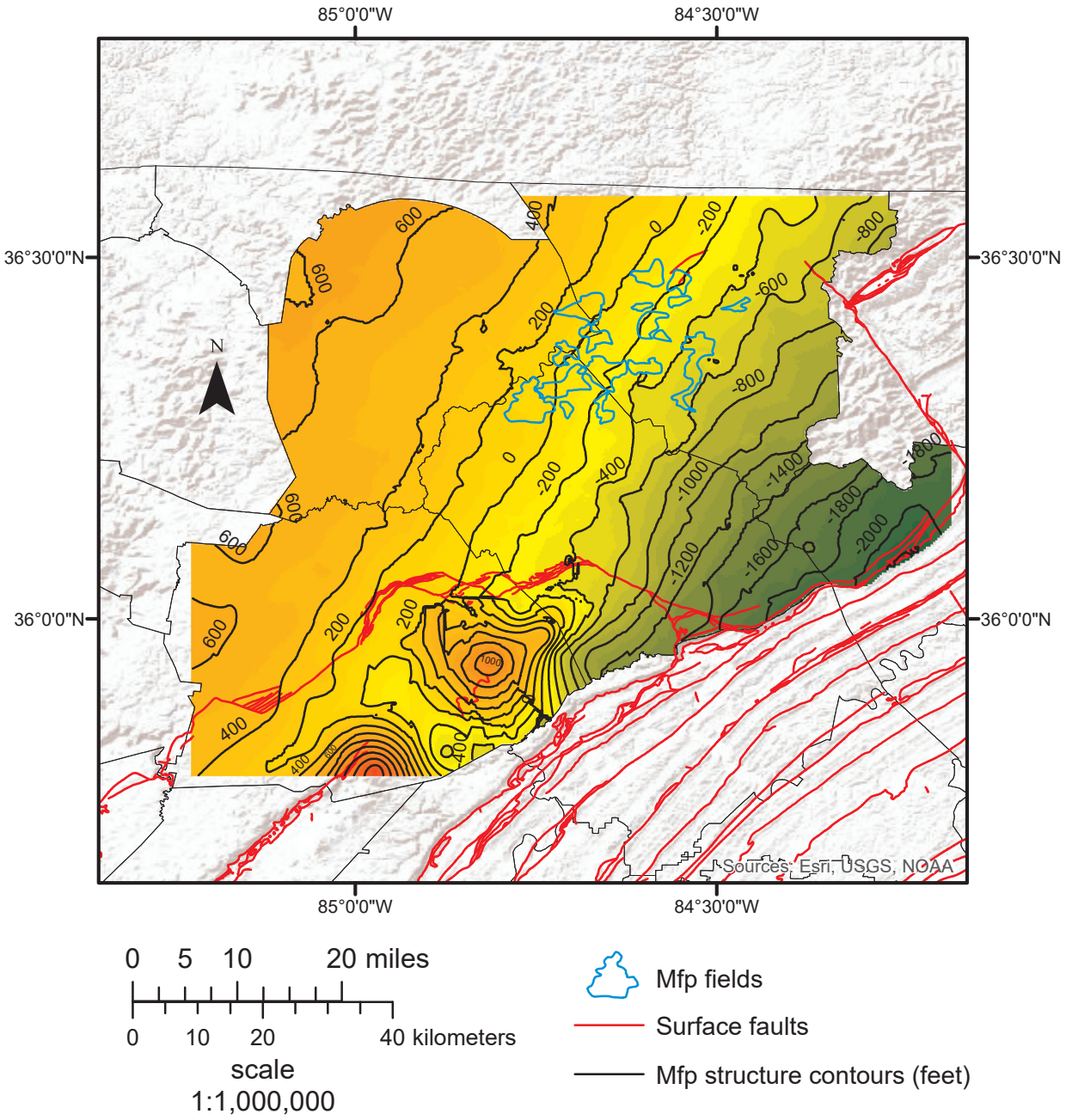


Figure 3-22. Structure contours on Mississippian Fort Payne Formation interpolated from 3,263 wells using ArcGIS. Carbonate mounds located in homoclinal ramp. Structural high south of surface expression of Cumberland Plateau overthrust reflects displacement by Sequatchie valley-Cumberland Plateau overthrust system. Well data from Evenick (2006) are incorporated. Contour interval 200 ft.

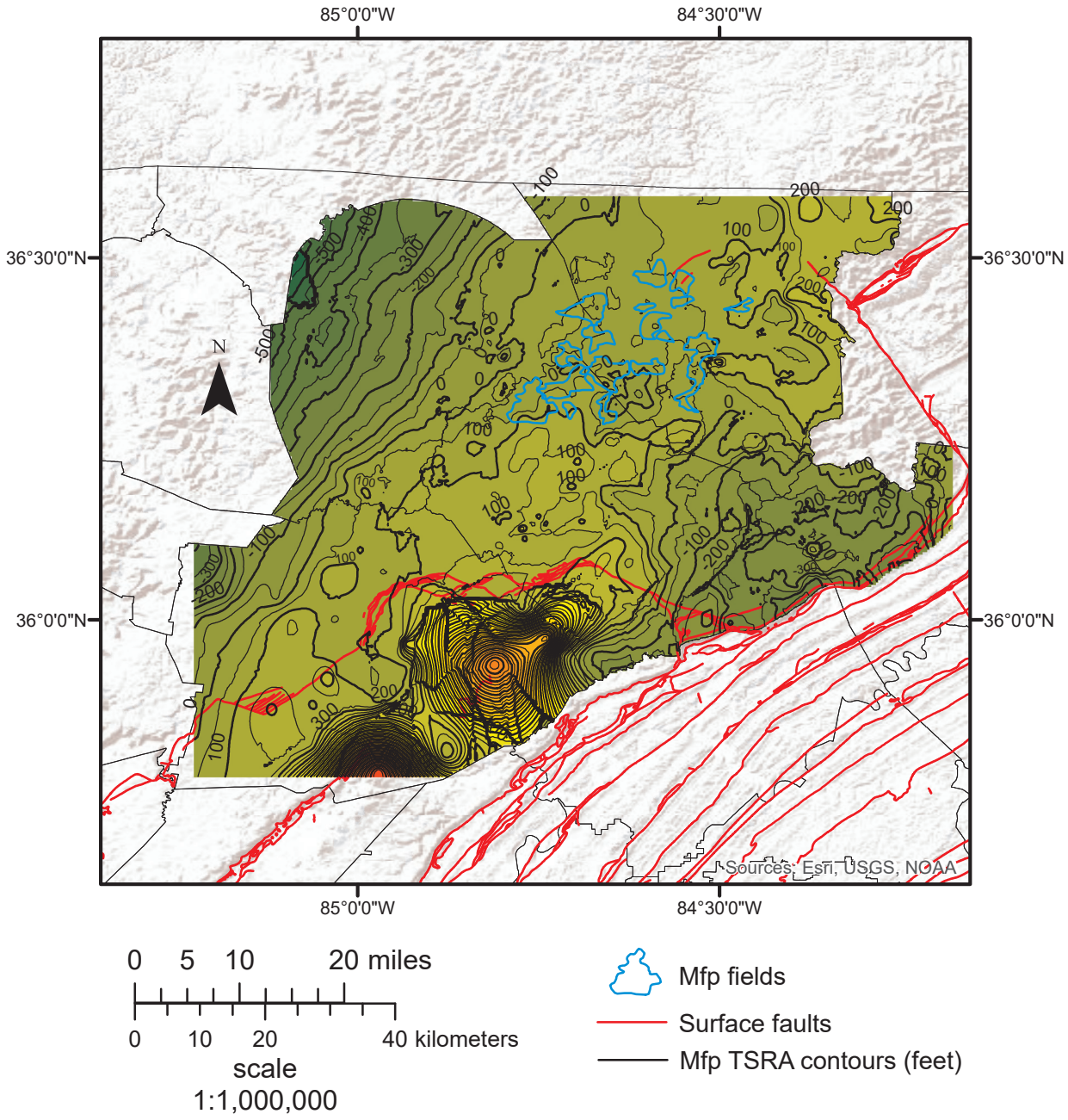


Figure 3-23. TSRA contours on Mississippian Fort Payne Formation interpolated from 3,263 wells using ArcGIS. A broad antilicline NW of the Wartburg basin is revealed. Saddle in carbonate mound area is revealed. Linear features present on the Chattanooga Shale surface in carbonate mound area are less pronounced due to thinning of Fort Payne Formation over pre-existing topographic highs. Well data from Evenick (2006) are incorporated. Contour interval 100 ft.

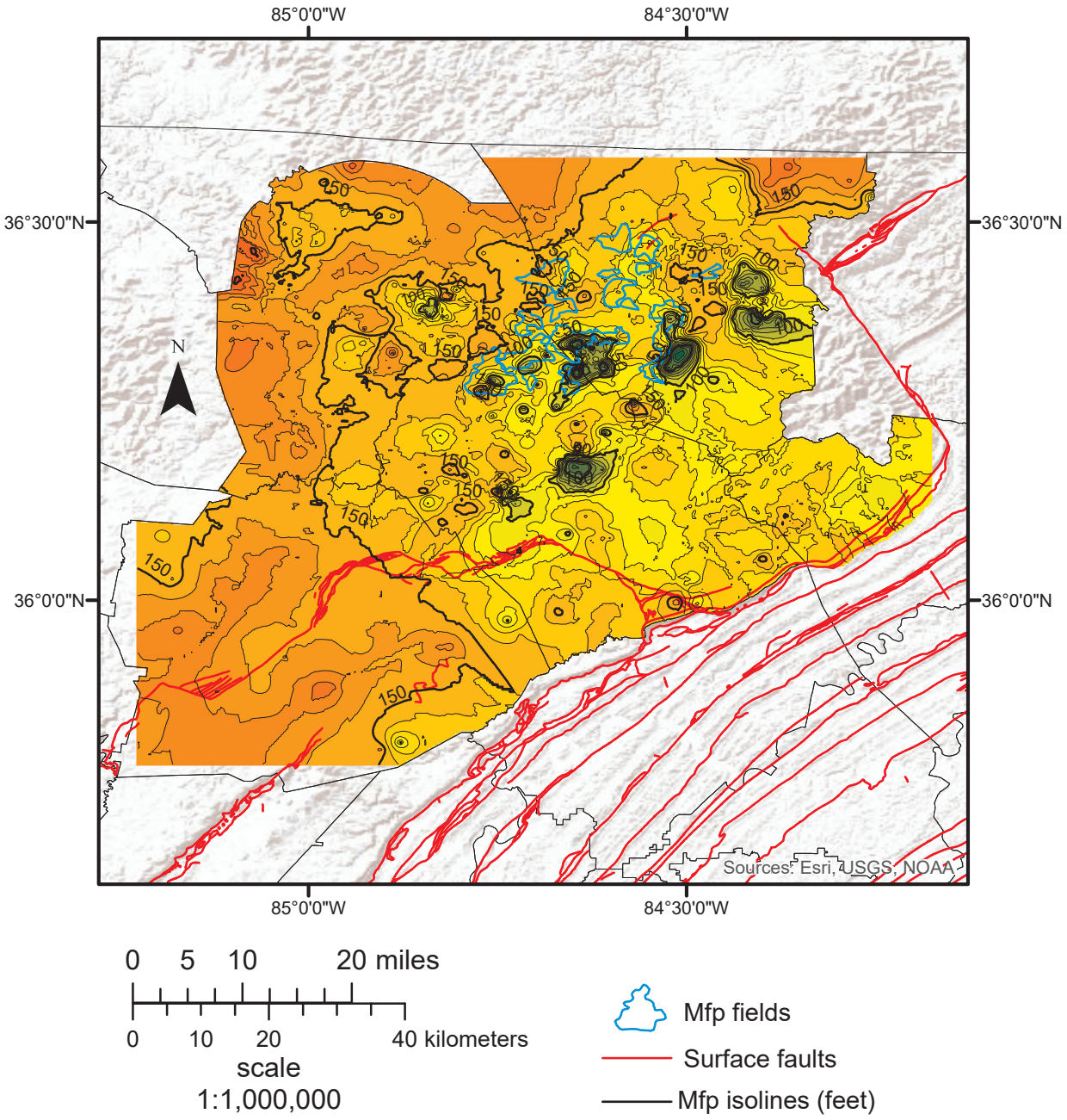


Figure 3-24. Isopach map showing thickness of Mississippian Fort Payne Formation interpolated from 2,572 wells using ArcGIS. Fort Payne thins over broad anticline NW of Wartburg basin, likely due to differential compaction. Carbonate mounds located on NW side of areas where thickness decreases. Well data from Evenick (2006) are incorporated. Contour interval 50 ft.

Table 3-1. Oil and gas fields producing from upper Fort Payne carbonate mounds.

Field	Area (sq. miles)
Rugby	2.48
Boone Camp	0.91
Union Hill	1.98
Burrville	9.15
Indian Creek	6.25
Honey Creek South	3.06
Hurricane Ridge	5.88
Robbins	2.7
Gum Branch	6.56
Low Gap Reuben Hollow	7.93
Bendix Spur	0.76
Lick Branch	3.41
Mile One	0.76
High Point	2.53
Oneida West	3.57
Helenwood West	1.19
John Hall Flats	1.07

homogenous and decreases slightly along strike to the NE. With the regional dip removed, there is a very open, SW-plunging anticline where the carbonate mounds are present (Fig. 3-18). The presence of this anticline provides evidence that the dip in this area is slightly below average and decreases to the NE.

The elevation of the Mississippian-Devonian Chattanooga Shale ranges from approximately sea level to ~700 ft (215 m) below sea level below the mounds (Fig. 3-20). The dip on the Chattanooga Shale is relatively homoclinal, not only below the carbonate mounds area, but also to at least the Tennessee-Kentucky state line along strike to the NE and for approximately 17 miles (27 km) beyond the extent of the mounds SW along strike. This dip is likely related to uplift of the Nashville dome/Cincinnati arch. The homocline suggests that this area likely had a relatively homogenous dip before uplift.

The Chattanooga Shale TSRA map (Fig. 3-23) reveals structural complexity that is not apparent in the simple structure contour map (Fig. 3-21). Relative to regional dip, the carbonate mounds occur above a low point along the crest of a broad anticline. The average height above

the regional dip surface where the carbonate mounds are present is 109 ft (33 m), whereas the elevation of the Chattanooga Shale surface immediately to the SW and NE is consistently 150 to 200 feet (45-60 m) above the regional dip surface. Within the extent of the carbonate mounds, mounds are located northwest of linear, strike-parallel anticlines on the surface of the Chattanooga Shale (Fig. 3-25). Three of the largest fields—Burrville, Indian Creek, and Gum Branch— are located on the northwest side of the most prominent Chattanooga Shale anticline.

The thickness between the top of the Chattanooga Shale and the Deicke bentonite was interpolated and contoured to determine the relationship to the strata on both sides of the pre-Chattanooga Shale unconformity. The isopach map (Fig. 3-19) shows a gradual thickness increase to the southeast from ~875 ft (265 m) to ~1025 ft (310 m). Unfortunately, there are relatively few well logs that show both the Chattanooga Shale and Deicke bentonite in this area, so the interpolated isopach map is only useful for first-order trends.

Where mounds are present in the Fort Payne Formation, the unit dips southeast from ~200 ft (60 m) above sea level to ~600 ft (180 m) below sea level and maintains relatively consistent strike and dip from the north side of the Cumberland Plateau overthrust sheet to at least the Tennessee-Kentucky border (Fig. 3-22). The broad anticline present in the Chattanooga Shale TSRA map (Fig. 3-21) is also apparent in the Fort Payne Formation TSRA map (Fig. 3-23), and the extent of the carbonate mounds lies in a structurally low area (Fig. 3-26). The top of the Fort Payne Formation is, on average, 47 ft (14 m) above the first-order regional dip surface with small areas greater than 50 ft (15 m) below the regional dip surface. Along strike to the NE and SW immediately outside of the extent of the upper Fort Payne Formation carbonate mounds, the top of the Fort Payne Formation is 100-200 ft (30-60 m) above the regional dip surface. Within the extent of the carbonate mounds, the along-strike ridges present on the Chattanooga Shale are present on the Fort Payne Formation, but they are not as pronounced. The ridges on the Fort Payne Formation are not as pronounced as those on the Chattanooga Shale because the Fort Payne Formation decreases thickness over structurally high Chattanooga Shale (Figs 3-26; 3-27). Carbonate mounds are generally correlated with steep slopes on the isopach map where the

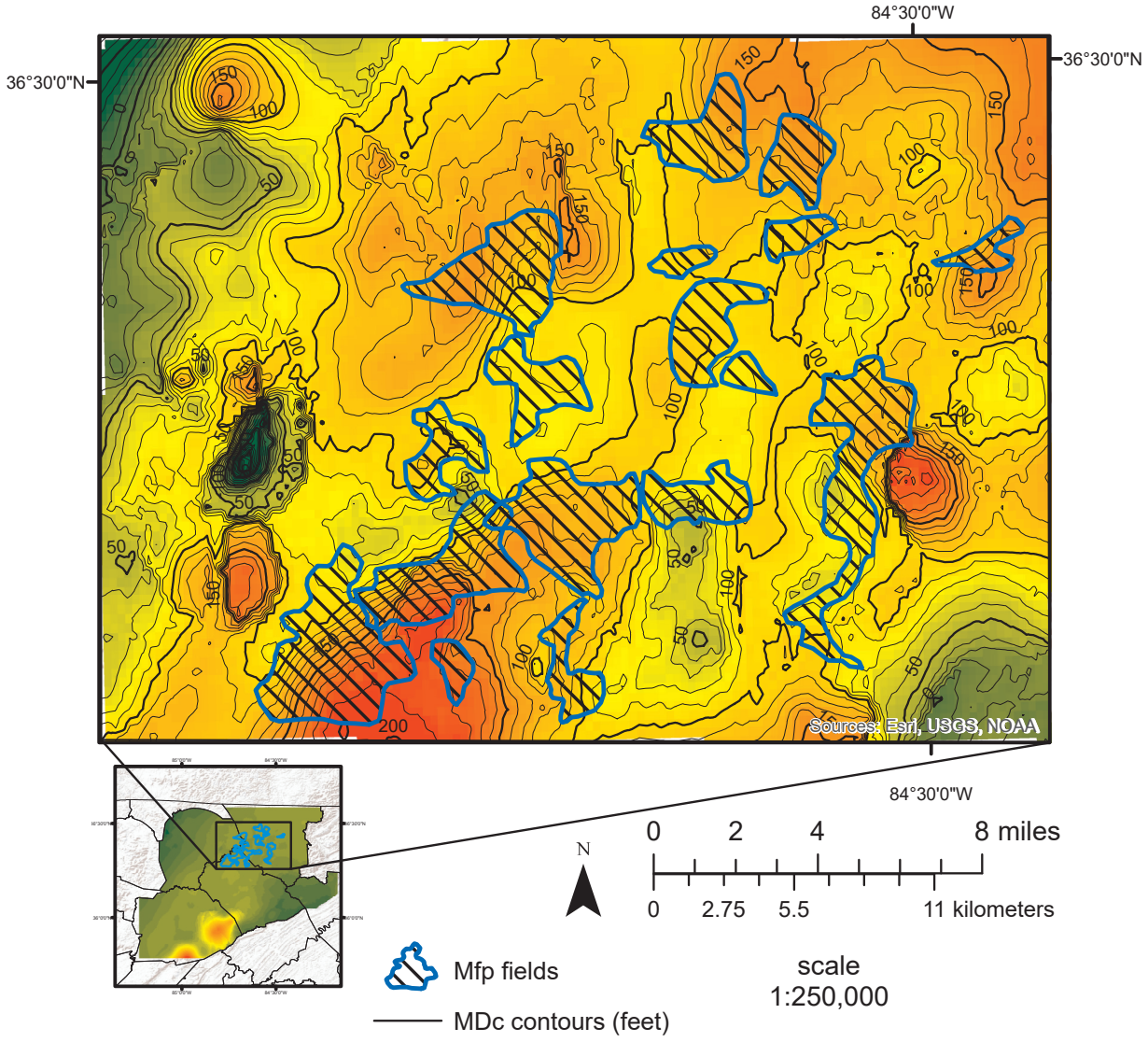


Figure 3-25. TSRA map on surface of Devonian-Mississippian Chattanooga Shale shown only at extent of known upper Fort Payne Formation carbonate mounds. Carbonate mounds generally present on northwest side of Chattanooga Shale anticlines.

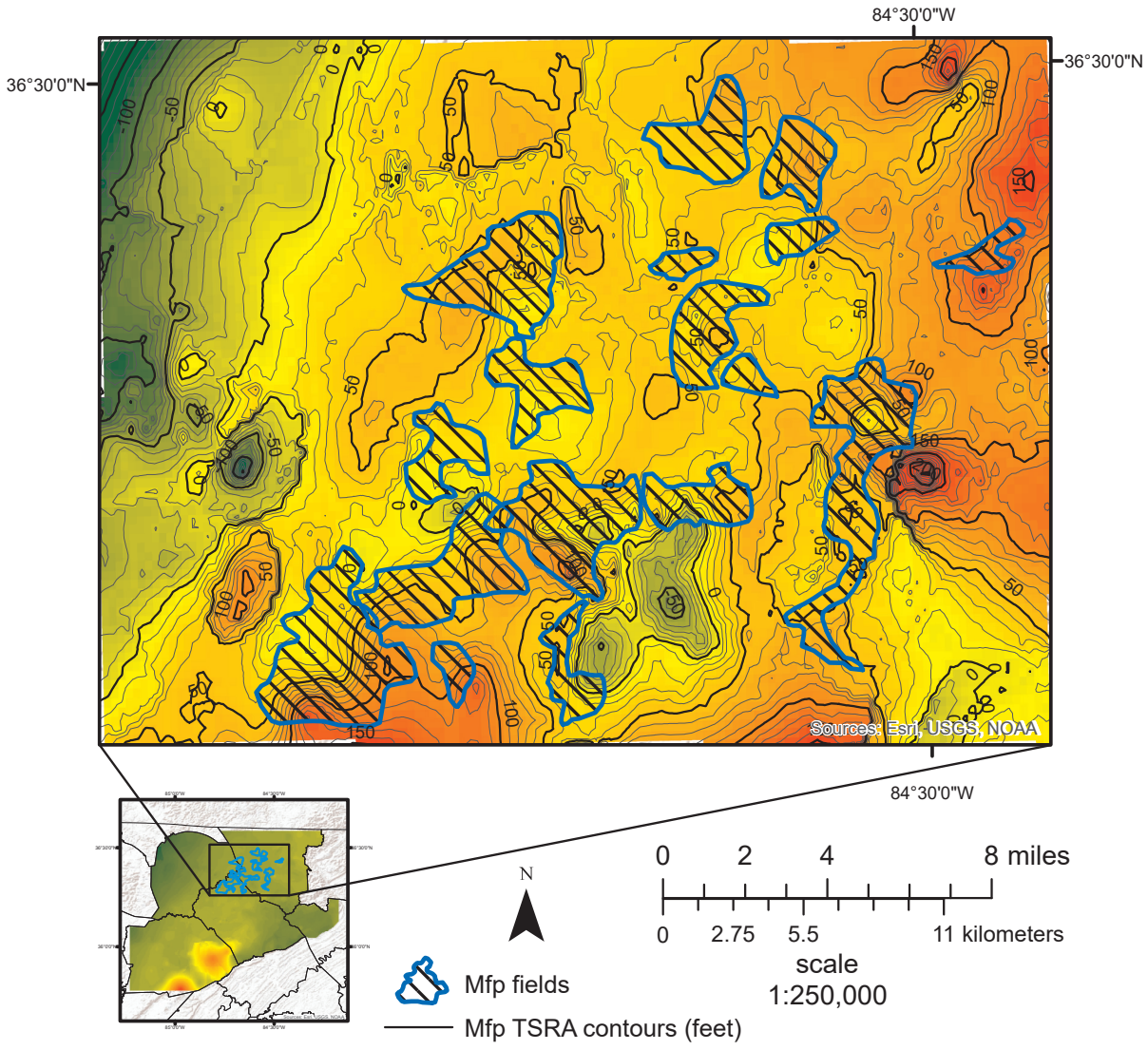


Figure 3-26. TSRA map on the surface of Fort Payne Formation shown only at extent of known upper Fort Payne Formation carbonate mounds. Linear anticlines not as pronounced as those on Chattanooga Shale because of decreasing thickness of Fort Payne Formation.

thickness decreases at least 30 ft (10 m) and as much as 100 ft (30 m). This is most likely related to differential compaction over topographic highs.

Carbonate mound discussion

Several structures that are not recognizable on ordinary structure-contour maps are easily identified on TSRA maps, because it is much easier to recognize changes in elevation relative to a regional dip surface than it is to recognize subtle changes in slope with a regional dip surface masking relatively small-scale structures. The broad anticline on the Chattanooga Shale and Fort Payne Formation surfaces is one example. The relatively shallow dip of this area compared to the rest of the study area produces a broad, gently dipping anticline on the TSRA maps that would not be recognizable with structure contours only.

MacQuown and Perkins (1982) proposed a developmental history for these carbonate mounds that is supported by the structural trends observed through subsurface mapping. They proposed that a lower part of the sub-mound unit of the Fort Payne Formation, containing primary sucrosic dolomite and local evaporitic facies, was deposited in a shallow sea that gave way to a transgression combined with shelf subsidence faster than carbonate progradation for the upper part of the sub-mound. Local highs on the seafloor, reflecting pre-existing topography, resulted in loci for growth of in situ crinoids and deposition of biogenic debris, creating a firm substrate for mound development (MacQuown and Perkins, 1982). The mound units were deposited in shallow- to moderate-depth transgressing shelf seas (MacQuown and Perkins, 1982). Bryozoan fragments and other biogenic sediment were transported by storm currents and baffled by in situ bryozoan colonies (MacQuown and Perkins, 1982). Strike-parallel bathymetric highs likely played a strong role in channeling storm currents that transported abundant bryozoan fragments (MacQuown and Perkins, 1982).

In terms of regional structure, the oil- and gas-bearing carbonate mounds of the upper Fort Payne Formation are confined to a structurally unique zone in the subsurface of the Cumberland Plateau. The four most important structural factors differentiating carbonate mound-bearing Fort Payne Formation from the surrounding area are: (1) a broad area of relatively low dip on the Fort

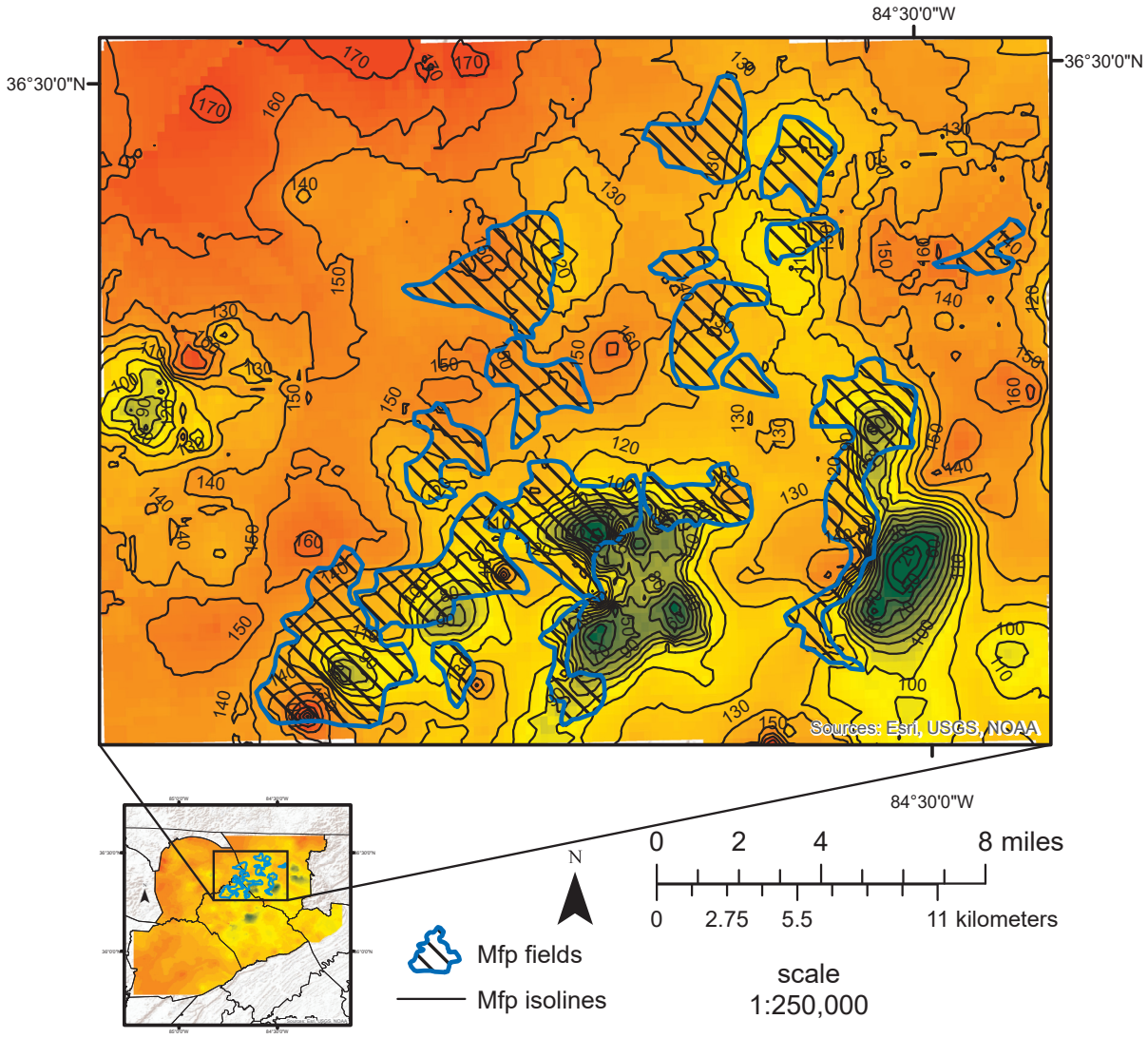


Figure 3-27. Isopach map showing thickness of Mississippian Fort Payne Formation for extent of known upper Fort Payne Formation carbonate mounds. Unit thins over Chattanooga Shale anticlines.

Payne Formation and Chattanooga Shale surfaces, which is characterized by a gentle NE-SW-striking anticline on TSRA maps; (2) structurally low Fort Payne Formation and Chattanooga Shale surfaces on the crest of the anticline just northwest of the Wartburg basin; (3) small-scale, along-strike ridges on the Chattanooga Shale surface; and (4) relatively abrupt decreases in thickness of the Fort Payne Formation, likely reflecting compaction over pre-existing highs.

The origin of the topographic highs on the Chattanooga Shale may reflect Acadian-Neoacadian tectonic activity as indicated by the clastic Chattanooga Shale and eastward-increasing clastic units in the Mississippian sequence toward the Appalachian interior (Hatcher et al., 2007a). This includes the possibility of reactivation of pre-Devonian faults. The ridges could also reflect topographic highs on erosion ally resistant units below the pre-Chattanooga Shale unconformity. Both explanations could produce strike-parallel ridges, and further investigation into pre-Devonian stratigraphy is needed to determine an exact mechanism.

CHAPTER IV

CONCLUSIONS

1) Detailed geologic maps of Fox Creek, Hebbertsburg, and Lancing 7.5-minute quadrangles were produced at 1:24,000 scale. Differentiation of units was based on stratigraphic position as well as careful attention to lithologic elements. Recognition of structural elements was based on bedding measurements, topography, and presence of cataclasite. These maps are available online at https://irma.nps.gov/App/Reference/Profile/2224385, and plans are made to publish the three quadrangles in a peer-reviewed journal.

2) The Cumberland Plateau overthrust and the Sequatchie Valley fault are genetically indistinguishable at depth and should be considered parts of the same system. Part of the Sequatchie anticline—plunging NE at ~3°—and small, minimal displacement branches of the Sequatchie Valley fault are present at the surface in the Lancing quadrangle. The northeastern terminus of the Sequatchie anticline is the Emory River tear fault, a dextral strike-slip component of the Cumberland Plateau overthrust, and forms the northeast boundary of the Cumberland Plateau overthrust sheet. Field relationships and mechanically viable cross sections in the three quadrangles provide further evidence of the relationships between the Sequatchie Valley fault and Cumberland Plateau overthrust.

3) Contrasting strength between lithotectonic units is a major control on the geometry of the Cumberland Plateau overthrust at the surface. Comparison of the Cumberland Plateau overthrust and Pine Mountain thrust indicates that the major difference between the two systems is the stratigraphic position of the upper weak zone detachment. An upper detachment is present in the mechanically weak Chattanooga Shale of the Pine Mountain thrust, but this unit is not thick enough below the northern Cumberland Plateau overthrust sheet to accommodate propagation of the Cumberland Plateau overthrust. The Cumberland Plateau overthrust, therefore, outcrops in Pennsylvanian sandstone and shale as a complex series of thrusts and short, steep tear faults.

4) Upper Fort Payne Formation carbonate mounds are confined to a structurally unique zone in the Cumberland Plateau subsurface. The four most important structural factors differentiating carbonate mound-bearing Fort Payne Formation from the surrounding area are: (1) an area of relatively low dip along strike on the Fort Payne and Chattanooga Shale surfaces, which is characterized by a gentle NE-SW-striking anticline on TSRA maps; (2) structurally low Fort Payne and Chattanooga Shale surfaces on the crest of the anticline just northwest of the Wartburg basin; (3) small-scale, along-strike anticlines on the Chattanooga Shale surface; and (4) relatively abrupt decreases in thickness of the Fort Payne Formation, likely due to compaction over pre-existing highs.

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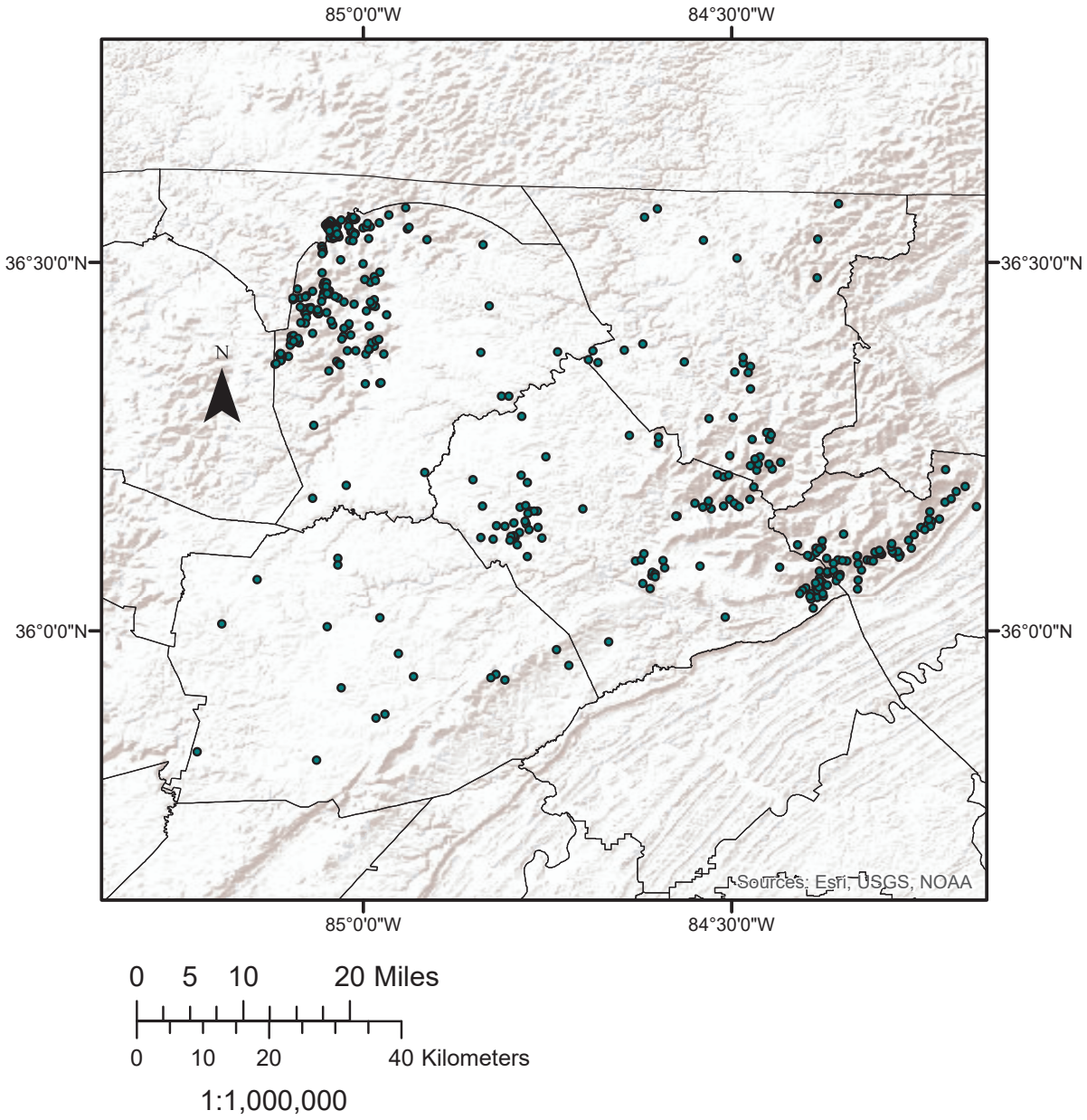
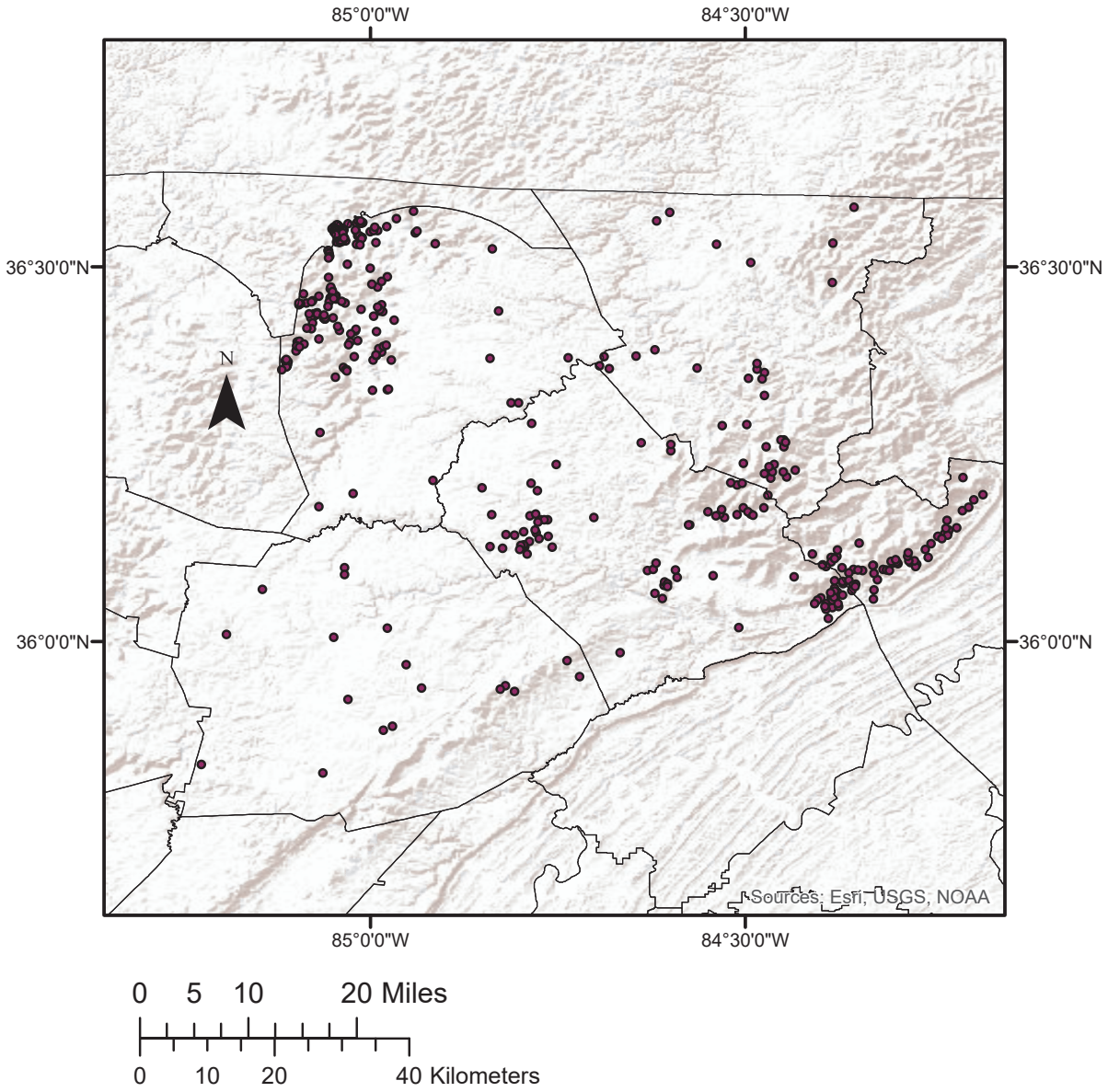
APPENDIX

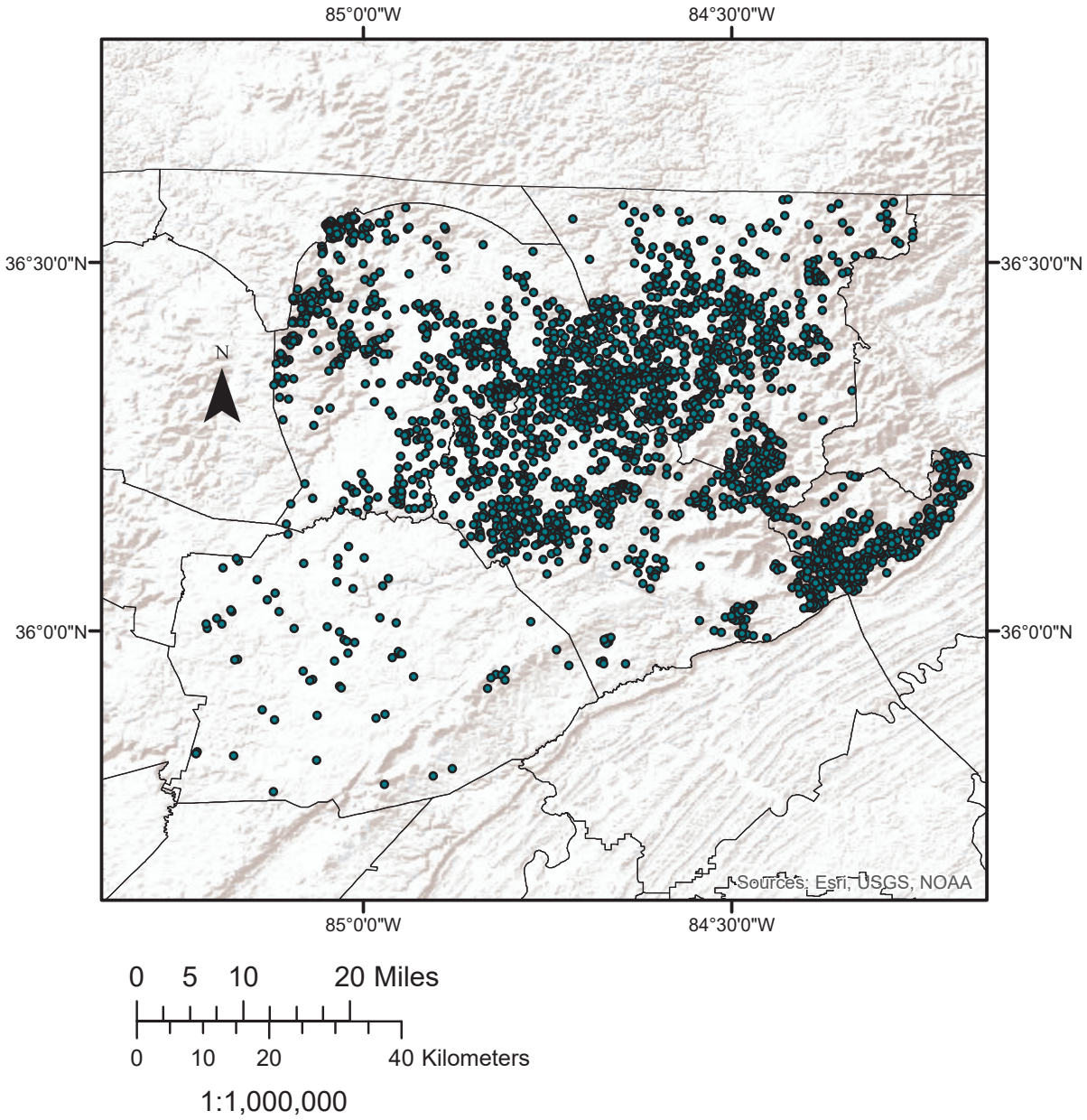
Well locations and first-order polynomizations for subsurface map area.



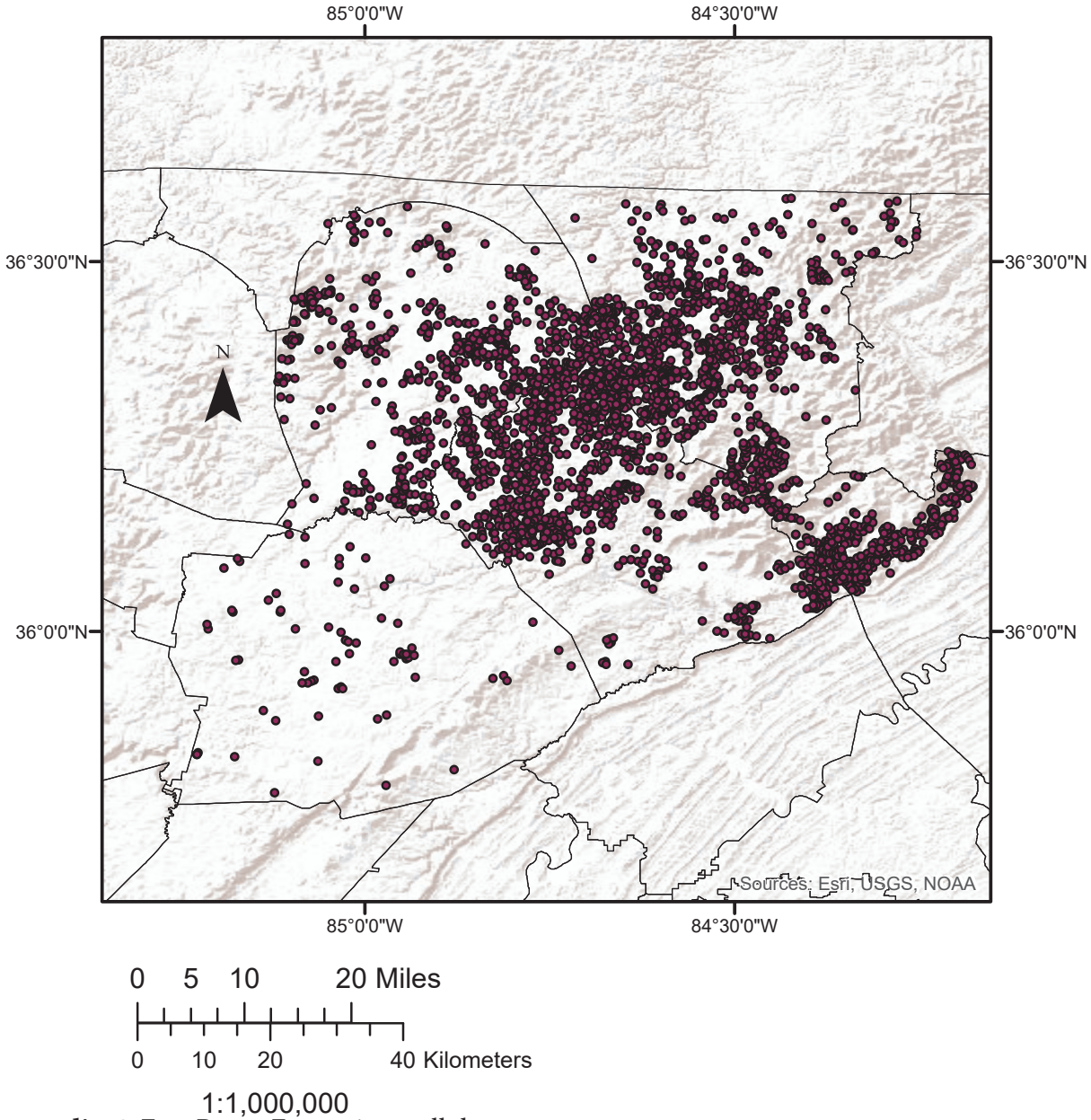
Appendix-1. Deicke bentonite well data.



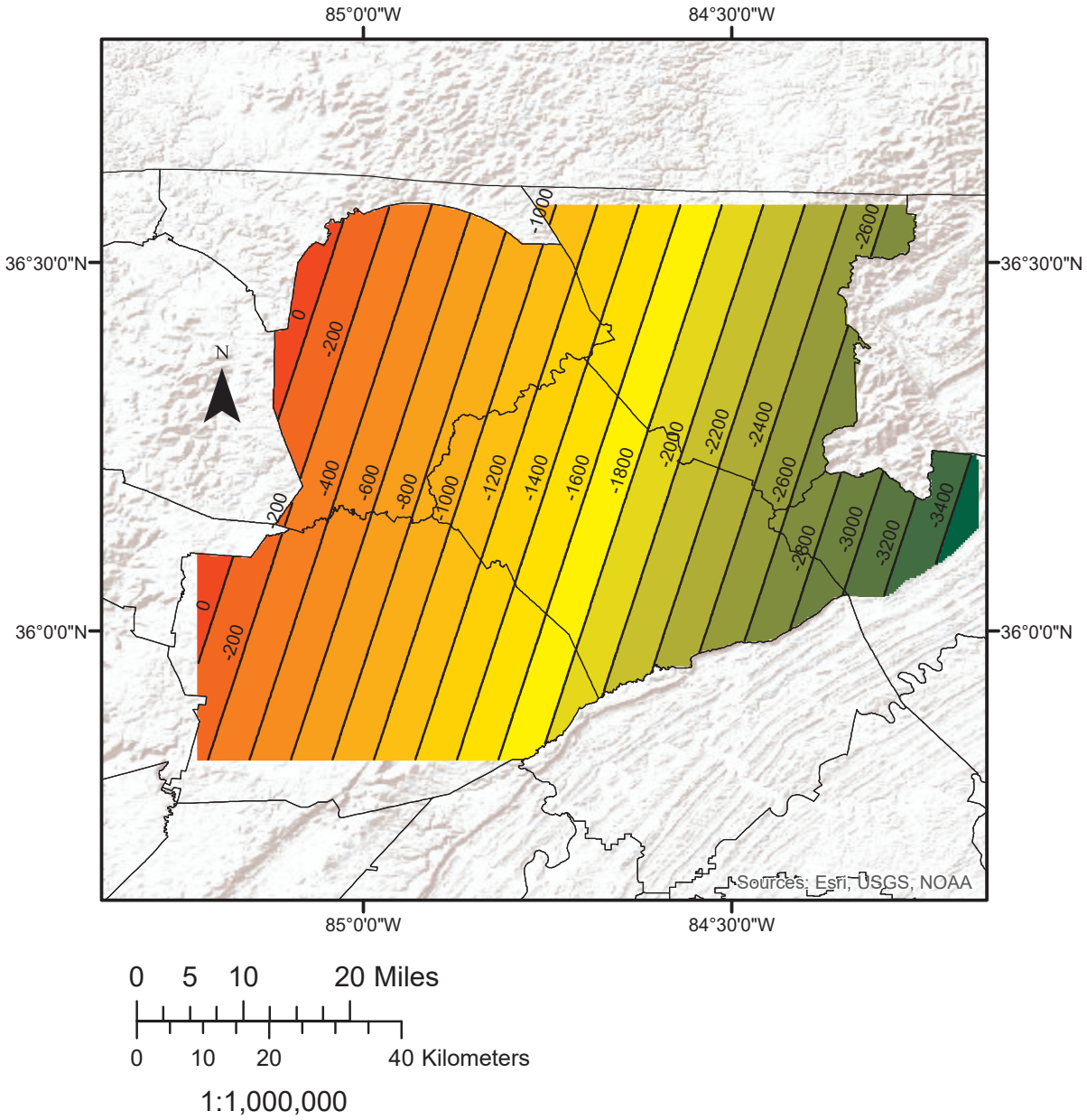
Appendix-2. Deicke bentonite-Chattanooga Shale isopach well data.



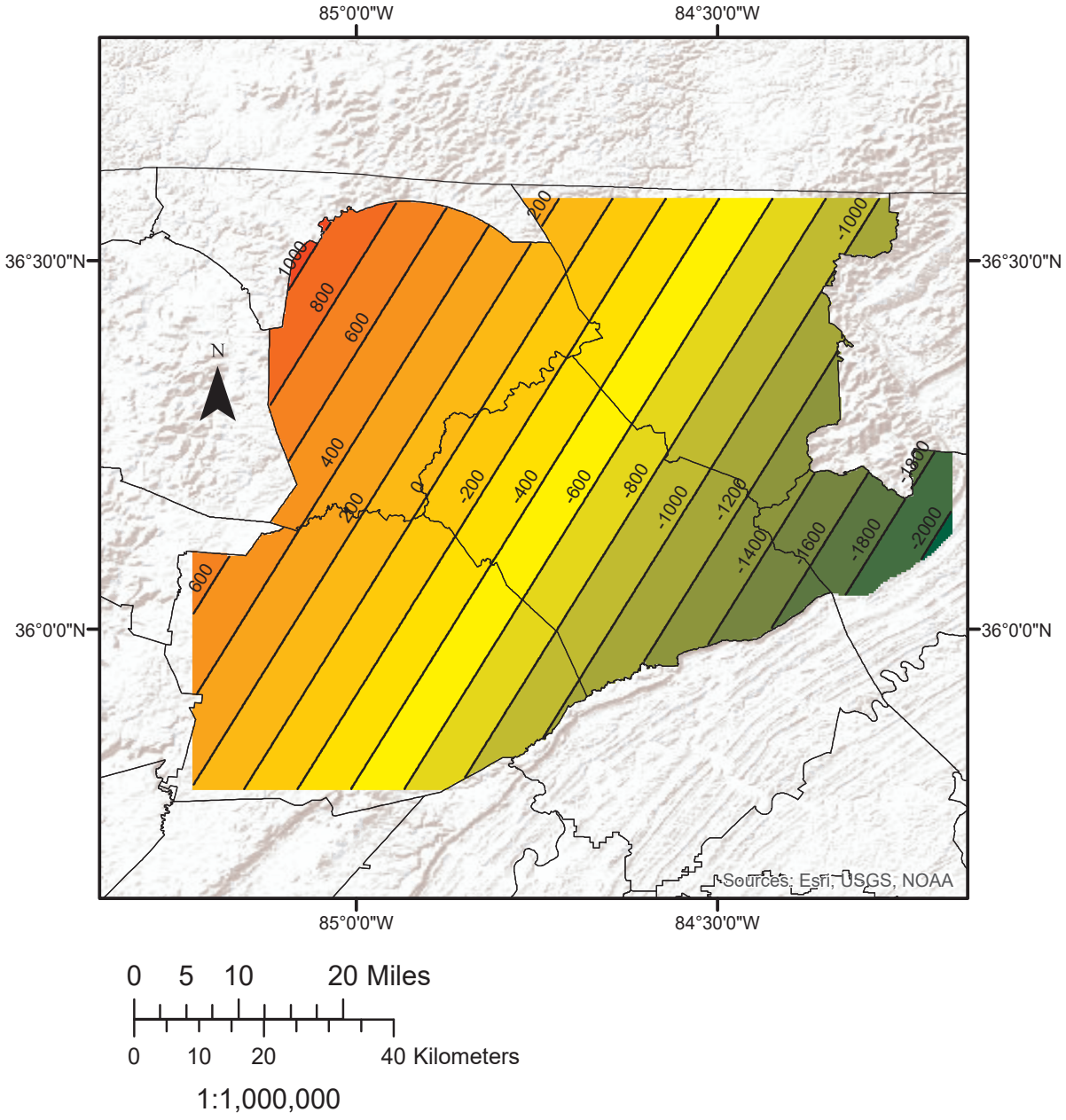
Appendix-3. Chattanooga Shale well data



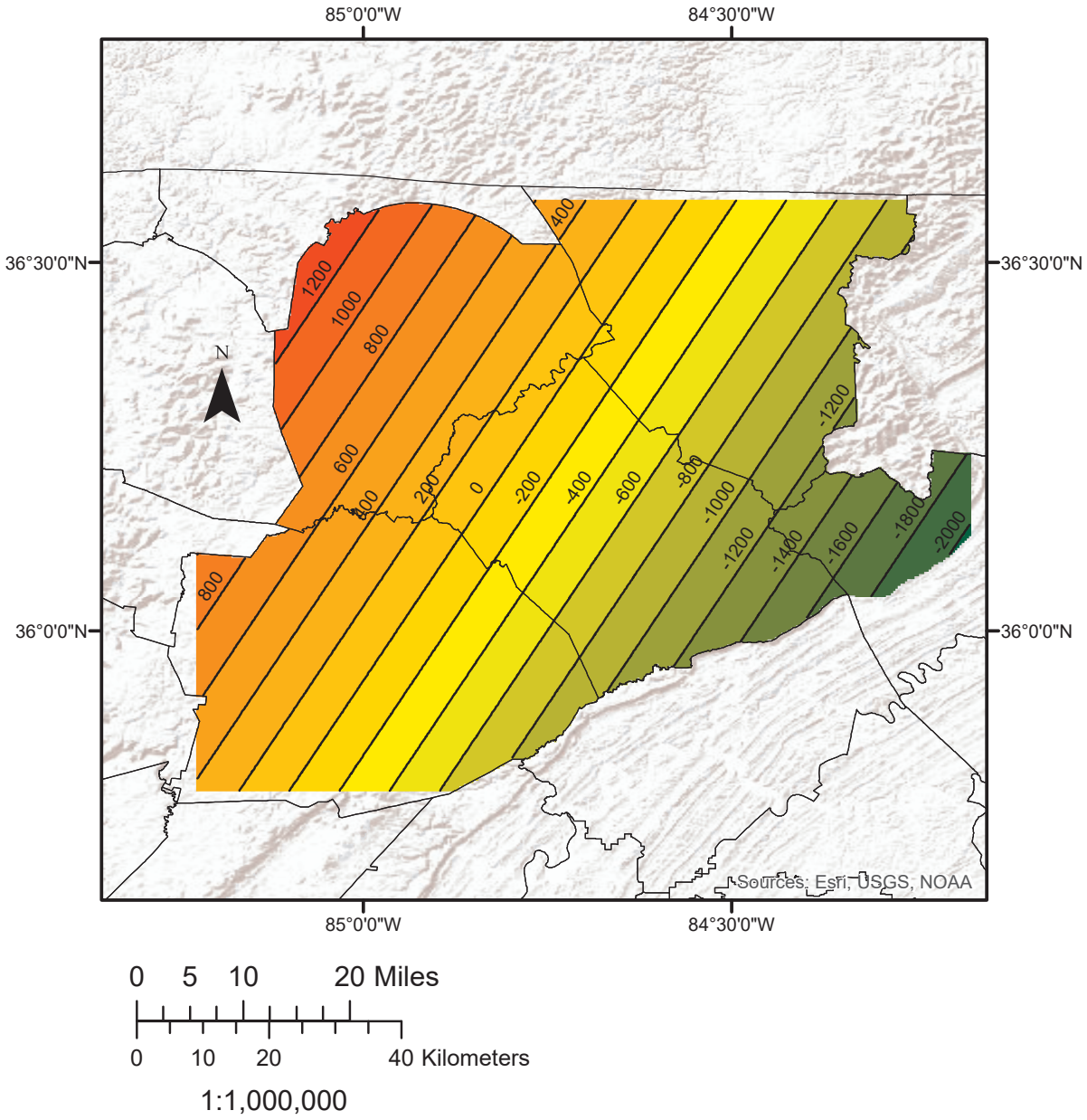
Appendix-4. Fort Payne Formation well data.



Appendix-5. First-order polynomization of Deicke bentonite.



Appendix-6. First-order polynomization of Chattanooga Shale.



Appendix-7. First-order polynomization of Fort Payne Formation.

Well Data

[Does not include data from Evenick (2006)]

API	County	Longitude	Latitude	Permit	Elevation	Mfp SL	Mfp Iso	MDc SL	Od SL	MDc-Od Iso
129-21649	Morgan	-84.43411111	36.08577778	9813	1429	-1531	130	-1661	-2805	-9683
001-20042	Anderson	-84.38466667	36.11161111	9834	1730	-1610	104	-1714	-2904	-9730
001-20043	Anderson	-84.37711111	36.11327778	9840	1700	-1577	146	-1723	-2906	-9694
129-21650	Morgan	-84.47438889	36.17797222	9842	1402	-1248	68	-1316	-2396	-9774
129-21651	Morgan	-84.57344444	36.15522222	9843	1286	-822	108	-930	-1968	-9735
001-20044	Anderson	-84.18638889	36.23208333	9844	980	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
001-20045	Anderson	-84.18286111	36.19408333	9850	955	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
151-21462	Scott	-84.47411111	36.22383333	9851	1545	-1069	98	-1167	-2260	-9753
129-21652	Morgan	-84.57511111	36.15513889	9852	1286	-824	109	-933	-1980	-9743
001-20046	Anderson	-84.38036111	36.12105556	9855	1565	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
001-20047	Anderson	-84.37633333	36.12177778	9858	1608	-1582	157	-1739	-2952	-9701
001-20048	Anderson	-84.41025	36.11613889	9860	2344	-1521	170	-1691	-2830	-9690
001-20049	Anderson	-84.38497222	36.10536111	9863	1924	-1876	82	-1958	-3363	-9781
001-20050	Anderson	-84.37988889	36.10233333	9867	2444	-1607	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
001-20051	Anderson	-84.34180556	36.07355556	9885	1190	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
001-20052	Anderson	-84.34	36.07722222	9892	1076	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
129-21653	Morgan	-84.80027778	36.12277778	9894	1361	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
129-21654	Morgan	-84.50175	36.17791667	9896	1364.1	-1069.9	116	-1185.9	-2252.9	-9780
129-21655	Morgan	-84.49233333	36.16997222	9897	1265	-1141	107	-1248	-2327	-9790
001-20053	Anderson	-84.18461111	36.19602778	9898	998	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
049-21460	Fentress	-85.0715	36.43455556	9900	872	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
001-20054	Anderson	-84.18461111	36.19355556	9906	1039	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
129-21656	Morgan	-84.54913889	36.17230556	9907	1279	-981	110	-1091	-2138	-9797
129-21657	Morgan	-84.41866667	36.09261111	9912	1451	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
129-21658	Morgan	-84.53894444	36.16711111	9915	1110	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
129-21659	Morgan	-84.51058333	36.20852778	9917	2678	-927	121	-1048	-2094	-9796
129-21660	Morgan	-84.51044444	36.16905556	9918	1209	-1071	108	-1179	-2254	-9810
129-21661	Morgan	-84.52747222	36.16536111	9921	1157	-993	155	-1148	-2231	-9766
151-21463	Scott	-84.46908333	36.19444444	9922	2822	-1166	108	-1274	-2362	-9814
151-21464	Scott	-84.44808333	36.26858333	9925	2515	-927	120	-1047	-2134	-9805
151-21465	Scott	-84.49772222	36.28936111	9929	1274	-751	105	-856	-1882	-9824
151-21466	Scott	-84.461	36.23566667	9930	2617	-1043	120	-1163	-2277	-9810
151-21467	Scott	-84.47161111	36.25919444	9931	1986	-851	131	-982	-2050	-9800
129-21662	Morgan	-84.82330556	36.12416667	9935	1476	-28	136	-164	-1052	-9799
151-21468	Scott	-84.52997222	36.28733333	9938	1369	-641	102	-743	-1743	-9836
129-21663	Morgan	-84.76286111	36.16191667	9940	1503	-97	138	-235	-1129	-9802
129-21664	Morgan	-84.79372222	36.12633333	9944	1409	-91	132	-223	-1139	-9812
001-20038-R1	Anderson	-84.20652778	36.22113889	9946	1302	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!

API	County	Longitude	Latitude	Permit	Elevation	Mfp SL	Mfp Iso	MDc SL	Od SL	MDc-Od Iso
001-20055	Anderson	-84.18222222	36.19688889	9954	1177	-1945	116	-2061	#VAL-UE!	-9838
129-21665	Morgan	-84.80033333	36.13155556	9955	1220	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
129-21666	Morgan	-84.77572222	36.14188889	9960	1458	-92	136	-228	#VAL-UE!	-9824
129-21667	Morgan	-84.78061111	36.20480556	9962	1504	34	138	-104	#VAL-UE!	-9824
001-20056	Anderson	-84.18611111	36.19491667	9964	1000	-1950	104	-2054	#VAL-UE!	-9860
129-21668	Morgan	-84.78011111	36.14813889	9966	1419	-57	136	-193	-1071	-9830
049-21461	Fentress	-85.07180556	36.43552778	9969	860	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
129-21669	Morgan	-84.78713889	36.16736111	9970	1384	-116	124	-240	-1172	-9846
129-21670	Morgan	-84.783	36.20233333	9974	1485	33	132	-99	#VAL-UE!	-9842
001-20057	Anderson	-84.18686111	36.19672222	9975	1231	-1869	148	-2017	#VAL-UE!	-9827
129-21671	Morgan	-84.779	36.16991667	9978	1433	-59	124	-183	-1069	-9854
129-21672	Morgan	-84.81902778	36.14183333	9982	1549	-21	132	-153	-1043	-9850
129-21673	Morgan	-84.59025	36.08469444	9983	1302	-848	120	-968	-2058	-9863
129-21674	Morgan	-84.81344444	36.14047222	9985	1472	-58	138	-196	#VAL-UE!	-9847
129-21675	Morgan	-84.60822222	36.07469444	9991	1386	-687	149	-836	-1928	-9842
129-21676	Morgan	-84.84027778	36.12611111	9992	1597	45	102	-57	-923	-9890
049-21462	Fentress	-85.042	36.53916667	9994	865	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
001-20058	Anderson	-84.18505556	36.19777778	10006	1208	-1972	134	-2106	#VAL-UE!	-9872
129-21677	Morgan	-84.60202778	36.09777778	10013	1398	-702	110	-812	#VAL-UE!	-9903
049-21463	Fentress	-84.96536111	36.29675	10019	1687	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
129-21678	Morgan	-84.57008333	36.15802778	10020	1318	-762	128	-890	#VAL-UE!	-9892
049-21464	Fentress	-84.80219444	36.32188889	10028	1525	225	150	75	#VAL-UE!	-9878
129-21679	Morgan	-84.76225	36.13991667	10036	1441	-139	124	-263	-1141	-9912
129-21680	Morgan	-84.44427778	36.09141667	10042	1434	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
049-21465	Fentress	-84.80969444	36.32469444	10043	1508	238	122	116	#VAL-UE!	-9921
049-21466	Fentress	-85.04505556	36.53666667	10044	921	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
049-21467	Fentress	-85.04425	36.53758333	10047	985	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
129-21681	Morgan	-84.79905556	36.13141667	10048	1303	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
001-20059	Anderson	-84.35183333	36.076	10054	1064	-1722	114	-1836	-3144	-9940
129-21682	Morgan	-84.60747222	36.07908333	10055	1383	-707	140	-847	-1921	-9915
049-21468	Fentress	-85.037	36.52580556	10056	855	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!

API	County	Longitude	Latitude	Permit	Elevation	Mfp SL	Mfp Iso	MDc SL	Od SL	MDc-Od Iso
129-21683	Morgan	-84.53319444	36.16922222	10061	1206	-974	125	-1099	-2139	-9936
129-21684	Morgan	-84.53130556	36.17541667	10062	1339.5	-960.5	130	-1090.5	-2120.5	-9932
129-21685	Morgan	-84.61044444	36.08194444	10063	1408	-692	148	-840	#VAL-UE!	-9915
001-20060	Anderson	-84.34944444	36.07961111	10064	1121	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
129-21686	Morgan	-84.76930556	36.16058333	10068	1482	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
049-21469	Fentress	-85.06463889	36.45872222	10069	951	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
001-20061	Anderson	-84.33519444	36.08344444	10072	1085	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
001-20062	Anderson	-84.32066667	36.06677778	10080	853	-1937	158	-2095	#VAL-UE!	-9922
001-20063	Anderson	-84.39419444	36.12747222	10081	1569	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
049-21470	Fentress	-85.03427778	36.50944444	10085	979	#VAL-UE!	#VAL-UE!	979	#VAL-UE!	#VALUE!
001-20064	Anderson	-84.35491667	36.09561111	10086	2416	-1756	148	-1904	-3121	-9938
001-20065	Anderson	-84.32336111	36.08205556	10095	995	-1843	120	-1963	-3284	-9975
001-20066	Anderson	-84.32872222	36.10108333	10098	2438	-1789	144	-1933	-3206	-9954
129-21687	Morgan	-84.76769444	36.16191667	10102	1501	-99	120	-219	-1109	-9982
049-21471	Fentress	-84.80713889	36.31955556	10103	1519	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
129-21688	Morgan	-84.60108333	36.08152778	10106	1353	-741	152	-893	#VAL-UE!	-9954
001-20067	Anderson	-84.32747222	36.09072222	10109	1224	-1798	118	-1916	-3262	-9991
001-20068	Anderson	-84.37872222	36.11766667	10110	1848	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
049-21472	Fentress	-85.03555556	36.53772222	10113	918	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
129-21689	Morgan	-84.53633333	36.17519444	10114	1374	-922	153	-1075	#VAL-UE!	-9961
129-21690	Morgan	-84.791	36.11661111	10118	1476	#VAL-UE!	#VAL-UE!	-244	-1129	#VALUE!
129-21691	Morgan	-84.54272222	36.08711111	10121	1289	-1111	96	-1207	-2258	-10025
001-20069	Anderson	-84.36086111	36.09091667	10123	2088	-1708	162	-1870	-3096	-9961
129-21692	Morgan	-84.38616667	36.04708333	10125	884	-1809	148	-1957	-3197	-9977
129-21693	Morgan	-84.41866667	36.09261111	10126	1451	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
001-20070	Anderson	-84.40052778	36.12163889	10129	1613	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
001-20071	Anderson	-84.35202778	36.08366667	10133	1381	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
001-20072	Anderson	-84.33852778	36.08122222	10134	1272	-1768	116	-1884	#VAL-UE!	-10018
001-20073	Anderson	-84.40236111	36.12630556	10135	1510	-1512	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
001-20074	Anderson	-84.37430556	36.09972222	10136	2444	-1650	154	-1804	#VAL-UE!	-9982
049-21473	Fentress	-84.80391667	36.31941667	10137	1537	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
129-21694	Morgan	-84.77108333	36.15877778	10139	1473	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!

API	County	Longitude	Latitude	Permit	Elevation	Mfp SL	Mfp Iso	MDc SL	Od SL	MDc-Od Iso
129-21695	Morgan	-84.80119444	36.13183333	10140	1220	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
049-21474	Fentress	-85.02966667	36.53469444	10141	983	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
129-21696	Morgan	-84.38047222	36.07083333	10144	1113	-1676	165	-1841	-3073	-9979
129-21697	Morgan	-84.76583333	36.16394444	10147	1484	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
049-21475	Fentress	-85.03938889	36.53102778	10149	930	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
001-20075	Anderson	-84.37983333	36.10625	10152	2284	-1602	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
001-20076	Anderson	-84.37244444	36.12202778	10153	1633	-1599	150	-1749	#VAL-UE!	-10003
129-21698	Morgan	-84.519	36.21152778	10154	2598	-808	157	-965	-1985	-9997
129-21699	Morgan	-84.42269444	36.09411111	10155	1539	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
001-20077	Anderson	-84.39805556	36.12641667	10156	1589	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
001-20078	Anderson	-84.32766667	36.06838889	10157	1217	-1927	116	-2043	-3322	-10041
049-21476	Fentress	-85.04144444	36.53197222	10164	1003	#VAL-UE!	#VAL-UE!	608	9	#VALUE!
129-21700	Morgan	-84.79547222	36.12836111	10165	1432	-66	132	-198	-1106	-10033
129-21701	Morgan	-84.54061111	36.17247222	10166	1122	-907	139	-1046	#VAL-UE!	-10027
049-21477	Fentress	-85.05527778	36.52130556	10171	898	#VAL-UE!	#VAL-UE!	584	-30	#VALUE!
129-21702	Morgan	-84.53894444	36.16711111	10172	1110	-922	150	-1072	-2135	-10022
049-21478	Fentress	-85.04480556	36.53305556	10173	963	#VAL-UE!	#VAL-UE!	607	-1	#VALUE!
001-20079	Anderson	-84.32858333	36.05583333	10175	1201	-1987	130	-2117	-3391	-10045
151-21469	Scott	-84.47352778	36.32805556	10177	1835	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
151-21470	Scott	-84.47352778	36.32805556	10178	1835.5	-639.5	135	-774.5	-1785.5	-10043
129-21703	Morgan	-84.77622222	36.15930556	10180	1440	-68	136	-204	-1093	-10044
151-21471	Scott	-84.47472222	36.34605556	10184	1574	-589	161	-750	#VAL-UE!	-10023
151-21472	Scott	-84.48380556	36.36272222	10185	1651	-543	174	-717	-1750	-10011
049-21479	Fentress	-85.0545	36.51727778	10186	903	#VAL-UE!	#VAL-UE!	547	-101	#VALUE!
049-21480	Fentress	-85.03494444	36.54877778	10187	882	#VAL-UE!	#VAL-UE!	527	-103	#VALUE!
049-21481	Fentress	-85.04183333	36.53627778	10189	851	#VAL-UE!	#VAL-UE!	276	#VAL-UE!	#VALUE!
151-21473	Scott	-84.48369444	36.37063889	10190	1247.5	-562.5	163	-725.5	-1758.5	-10027
151-21474	Scott	-84.45191667	36.26858333	10191	2520	-920	119	-1039	-2121	-10072
049-21482	Fentress	-85.04494444	36.54602778	10192	899	#VAL-UE!	#VAL-UE!	574	-61	#VALUE!
129-21704	Morgan	-84.79902778	36.12775	10193	1404	-104	126	-230	-1140	-10067
049-21483	Fentress	-84.79855556	36.32422222	10195	1496.2	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
049-21484	Fentress	-85.07838889	36.45266667	10198	925	#VAL-UE!	#VAL-UE!	587	-23	#VALUE!
001-20080	Anderson	-84.38002778	36.10988889	10200	2051	-1589	153	-1742	-2952	-10047

API	County	Longitude	Latitude	Permit	Elevation	Mfp SL	Mfp Iso	MDc SL	Od SL	MDc-Od Iso
151-21475	Scott	-84.49755556	36.35358333	10201	1751.9	-58.1	163	-221.1	#VAL-UE!	-10038
129-21705	Morgan	-84.59263889	36.09477778	10202	1288	-852	117	-969	-2057	-10085
049-21485	Fentress	-84.80102778	36.32441667	10205	1504.3	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
001-20081	Anderson	-84.37166667	36.09213889	10207	2427	-1679	121	-1800	#VAL-UE!	-10086
001-20082	Anderson	-84.3705	36.09838889	10208	2458	-36	115	-151	-1182	-10093
001-20083	Anderson	-84.37525	36.10327778	10209	2069	-2066	149	-2215	#VAL-UE!	-10060
129-21706	Morgan	-84.80727778	36.14172222	10210	1408	-47	140	-187	-1100	-10070
049-21486	Fentress	-85.05405556	36.51338889	10213	918	#VAL-UE!	#VAL-UE!	600	-52	#VALUE!
049-21487	Fentress	-85.05547222	36.51186111	10217	939	#VAL-UE!	#VAL-UE!	614	-53	#VALUE!
001-20084	Anderson	-84.37425	36.117	10218	2025.9	-1592.1	158	-1750.1	#VAL-UE!	-10060
001-20085	Anderson	-84.37566667	36.10966667	10219	1764.9	-1594.1	157	-1751.1	#VAL-UE!	-10062
001-20086	Anderson	-84.37955556	36.09813889	10220	2838	-1635	156	-1791	#VAL-UE!	-10064
129-21707	Morgan	-84.38647222	36.05080556	10225	1056.3	-1791.7	148	-1939.7	-3158.7	-10077
129-21708	Morgan	-84.39186111	36.05005556	10226	942	-1778	110	-1888	-3120	-10116
049-21488	Fentress	-85.02991667	36.54158333	10232	987.3	#VAL-UE!	#VAL-UE!	597.3	#VAL-UE!	#VALUE!
129-21709	Morgan	-84.75733333	36.12552778	10233	1382	-150	149	-299	-1211	-10084
001-20087	Anderson	-84.37563889	36.1065	10236	2051.7	-1620.3	159	-1779.3	#VAL-UE!	-10077
001-20088	Anderson	-84.36508333	36.09597222	10241	2526.2	-1687.8	162	-1849.8	#VAL-UE!	-10079
001-20089	Anderson	-84.36819444	36.09355556	10242	2457.2	-1673.8	170	-1843.8	#VAL-UE!	-10072
129-21710	Morgan	-84.50791667	36.018	10244	1332	-1376	128	-1504	-2702	-10116
049-21489	Fentress	-85.00025	36.54655556	10254	921	#VAL-UE!	#VAL-UE!	601	-9	#VALUE!
049-21490	Fentress	-85.03652778	36.54169444	10255	887	#VAL-UE!	#VAL-UE!	587	-23	#VALUE!
049-21491	Fentress	-85.03519444	36.50083333	10256	2000	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
001-20090	Anderson	-84.20919444	36.2185	10261	1344	-1830	104	-1934	-3310	-10157
049-21492	Fentress	-84.96497222	36.56405556	10266	983.2	#VAL-UE!	#VAL-UE!	609.2	-146.8	#VALUE!
129-21711	Morgan	-84.62991667	36.09397222	10267	1269.2	-580.8	122	-702.8	-1762.8	-10145
049-21493	Fentress	-85.03052778	36.50322222	10268	1293	#VAL-UE!	#VAL-UE!	588	-62	#VALUE!
129-21712	Morgan	-84.62502778	36.09011111	10269	1197.1	-622.9	110	-732.9	#VAL-UE!	-10159
049-21494	Fentress	-84.93733333	36.54758333	10272	958	#VAL-UE!	#VAL-UE!	493	-347	#VALUE!
049-21495	Fentress	-84.80352778	36.32688889	10273	1513.6	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
129-21713	Morgan	-84.61013889	36.05669444	10274	1413.3	-728.7	133	-861.7	-1951.7	-10141
049-21496	Fentress	-84.80136111	36.32694444	10278	1473.4	#VAL-UE!	#VAL-UE!	183.4	#VAL-UE!	#VALUE!

API	County	Longitude	Latitude	Permit	Elevation	Mfp SL	Mfp Iso	MDc SL	Od SL	MDc-Od Iso
001-20091	Anderson	-84.18080556	36.19316667	10279	961	-1891	112	-2003	#VAL-UE!	-10167
129-21714	Morgan	-84.61975	36.06380556	10280	1417	-681	140	-821	-1949	-10140
049-21497	Fentress	-85.01152778	36.55775	10281	923	#VAL-UE!	#VAL-UE!	568	-47	#VALUE!
049-21498	Fentress	-85.04591667	36.54836111	10285	909	#VAL-UE!	#VAL-UE!	583	-42	#VALUE!
049-21499	Fentress	-85.079	36.43188889	10289	888	#VAL-UE!	#VAL-UE!	688	-89	#VALUE!
001-20092	Anderson	-84.34075	36.06102778	10297	1168.8	-1951.2	125	-2076.2	#VAL-UE!	-10172
001-20093	Anderson	-84.34244444	36.05786111	10301	992.6	-1949.4	144	-2093.4	#VAL-UE!	-10157
001-20094	Anderson	-84.35522222	36.08063889	10305	1073.8	-1730.2	134	-1864.2	#VAL-UE!	-10171
049-21500	Fentress	-85.04119444	36.54891667	10308	895	#VAL-UE!	#VAL-UE!	600	-3	#VALUE!
049-21501	Fentress	-84.98988889	36.54836111	10309	898.4	#VAL-UE!	#VAL-UE!	543.4	11.4	#VALUE!
049-21502	Fentress	-84.80386111	36.33002778	10310	1523	217	128	89	#VAL-UE!	-10182
049-21503	Fentress	-85.04241667	36.54822222	10311	884	#VAL-UE!	#VAL-UE!	574	-36	#VALUE!
049-21504	Fentress	-85.01166667	36.55911111	10313	943	#VAL-UE!	#VAL-UE!	583	#VAL-UE!	#VALUE!
049-21505	Fentress	-85.01030556	36.55852778	10315	938	#VAL-UE!	#VAL-UE!	607	39	#VALUE!
049-21506	Fentress	-84.80161111	36.33019444	10316	1519	227	132	95	#VAL-UE!	-10184
049-21507	Fentress	-85.04272222	36.55044444	10320	922	#VAL-UE!	#VAL-UE!	607	-3	#VALUE!
049-21508	Fentress	-84.79880556	36.32944444	10322	1519.9	221.9	138	83.9	#VAL-UE!	-10184
049-21509	Fentress	-85.04383333	36.54977778	10325	943	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
049-21510	Fentress	-85.01819444	36.55802778	10327	969	#VAL-UE!	#VAL-UE!	614	19	#VALUE!
049-21511	Fentress	-84.79847222	36.32741667	10332	2150	914	148	766	#VAL-UE!	-10184
049-21512	Fentress	-85.04144444	36.55	10333	972	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
049-21513	Fentress	-85.03733333	36.54986111	10342	895.7	#VAL-UE!	#VAL-UE!	570.7	-41.3	#VALUE!
049-21514	Fentress	-85.04030556	36.55063889	10347	888	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
049-21515	Fentress	-85.07966667	36.43286111	10352	941.8	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
151-21476	Scott	-84.3825	36.50358333	10354	2241	#VAL-UE!	#VAL-UE!	-683	#VAL-UE!	#VALUE!
049-21516	Fentress	-84.99175	36.55069444	10355	854	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
129-21715	Morgan	-84.80061111	36.12255556	10356	1381	-63	196	-259	-1164	-10160
049-21517	Fentress	-85.08266667	36.42516667	10357	921.3	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
049-21518	Fentress	-85.04325	36.55588889	10360	1014	#VAL-UE!	#VAL-UE!	599	-31	#VALUE!

API	County	Longitude	Latitude	Permit	Elevation	Mfp SL	Mfp Iso	MDc SL	Od SL	MDc-Od Iso
049-21519	Fentress	-85.04288889	36.5515	10361	1023	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
001-20095	Anderson	-84.34502778	36.07847222	10362	1292	-1734	134	-1868	#VAL-UE!	-10228
049-21520	Fentress	-84.7955	36.33030556	10366	1481.3	205.3	142	63.3	#VAL-UE!	-10224
151-21477	Scott	-84.33583333	36.52216667	10369	2292	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
049-21521	Fentress	-85.04086111	36.55319444	10370	998	#VAL-UE!	#VAL-UE!	633	28	#VALUE!
001-20096	Anderson	-84.34694444	36.07519444	10375	1341	-1761	118	-1879	#VAL-UE!	-10257
151-21478	Scott	-84.27116667	36.52541667	10376	2025.72	-842.28	161	-1003.28	#VAL-UE!	-10215
049-21522	Fentress	-85.04269444	36.55694444	10378	1025	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
129-21716	Morgan	-84.62227778	36.09561111	10379	1272	-613	145	-758	-1812	-10234
049-21523	Fentress	-84.79225	36.33025	10380	1482.3	223.3	155	68.3	#VAL-UE!	-10225
129-21717	Morgan	-84.61886111	36.10413889	10385	1218.3	-612.7	145	-757.7	-1816.7	-10240
049-21524	Fentress	-84.7925	36.32836111	10387	1479.1	213.1	146	67.1	#VAL-UE!	-10241
049-21525	Fentress	-84.79566667	36.32833333	10388	1471.3	217.3	154	63.3	#VAL-UE!	-10234
049-21526	Fentress	-85.04391667	36.55494444	10389	1018	#VAL-UE!	#VAL-UE!	618	-7	#VALUE!
151-21479	Scott	-84.28855556	36.54605556	10391	1218.71	-693.29	172	-865.29	#VAL-UE!	-10219
049-21527	Fentress	-85.04488889	36.53425	10392	866	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
001-20097	Anderson	-84.35655556	36.078	10397	1046.7	-1703.3	150	-1853.3	#VAL-UE!	-10247
049-21528	Fentress	-85.04097222	36.55130556	10402	982	#VAL-UE!	#VAL-UE!	642	37	#VALUE!
049-21529	Fentress	-84.80577778	36.32680556	10404	1531.4	#VAL-UE!	#VAL-UE!	211.4	#VAL-UE!	#VALUE!
049-21530	Fentress	-85.04311111	36.55272222	10405	989	#VAL-UE!	#VAL-UE!	657	48	#VALUE!
049-21531	Fentress	-84.8055	36.32291667	10406	1522	#VAL-UE!	#VAL-UE!	132	#VAL-UE!	#VALUE!
049-21532	Fentress	-84.99541667	36.54813889	10410	849	#VAL-UE!	#VAL-UE!	604	52	#VALUE!
049-21533	Fentress	-85.01272222	36.55902778	10415	918	#VAL-UE!	#VAL-UE!	624	28	#VALUE!
049-21534	Fentress	-84.99422222	36.55297222	10418	933	708	125	583	-52	-10293
001-20098	Anderson	-84.3585	36.07475	10421	1006.4	-1713.6	120	-1833.6	#VAL-UE!	-10301
151-21480	Scott	-84.47788889	36.35688889	10424	1735	-620	145	-765	#VAL-UE!	-10279
151-21481	Scott	-84.48397222	36.35477778	10425	1907	-589	144	-733	#VAL-UE!	-10281
049-21535	Fentress	-85.01327778	36.55827778	10426	877	#VAL-UE!	#VAL-UE!	617	14	#VALUE!
001-20099	Anderson	-84.34372222	36.08366667	10430	1764	-1778	114	-1892	#VAL-UE!	-10316
049-21536	Fentress	-85.01591667	36.56119444	10433	968	#VAL-UE!	#VAL-UE!	633	20	#VALUE!

API	County	Longitude	Latitude	Permit	Elevation	Mfp SL	Mfp Iso	MDc SL	Od SL	MDc-Od Iso
151-21482	Scott	-84.45875	36.19061111	10438	2884.6	-1216.4	123	-1339.4	#VAL-UE!	-10315
049-21537	Fentress	-85.03752778	36.53322222	10439	904	#VAL-UE!	#VAL-UE!	618	12	#VALUE!
049-21538	Fentress	-85.04036111	36.53394444	10443	822	#VAL-UE!	#VAL-UE!	627	27	#VALUE!
049-21539	Fentress	-85.03947222	36.535	10444	848	#VAL-UE!	#VAL-UE!	615	19	#VALUE!
151-21483	Scott	-84.45480556	36.19277778	10448	2879.1	-1254.9	104	-1358.9	#VAL-UE!	-10344
049-21540	Fentress	-84.80608333	36.32941667	10449	1524.7	242.7	138	104.7	#VAL-UE!	-10311
001-20100	Anderson	-84.31708333	36.08536111	10452	1097	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
151-21484	Scott	-84.45266667	36.19597222	10453	2822.2	-1245.8	110	-1355.8	#VAL-UE!	-10343
049-21541	Fentress	-84.80813889	36.32708333	10455	1521.2	257.2	144	113.2	#VAL-UE!	-10311
129-21718	Morgan	-84.4585	36.18669444	10456	2878.2	-1243.8	112	-1355.8	#VAL-UE!	-10344
049-21542	Fentress	-85.04466667	36.55591667	10457	1004	#VAL-UE!	#VAL-UE!	619	-6	#VALUE!
129-21719	Morgan	-84.45922222	36.18327778	10458	2933	-1262	105	-1367	#VAL-UE!	-10353
129-21720	Morgan	-84.45633333	36.17894444	10464	2874	-1282	104	-1386	#VAL-UE!	-10360
129-21721	Morgan	-84.45225	36.17569444	10468	2853	-1304	105	-1409	#VAL-UE!	-10363
129-21722	Morgan	-84.83675	36.18580556	10470	1529	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
129-21723	Morgan	-84.53922222	36.178	10472	1180	-904	147	-1051	#VAL-UE!	-10325
151-21485	Scott	-84.47355556	36.35816667	10477	1735	-607	138	-745	-1777	-10339
049-21543	Fentress	-85.03877778	36.55158333	10481	815.5	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
049-21544	Fentress	-85.04883333	36.55225	10482	916	#VAL-UE!	#VAL-UE!	601	-22	#VALUE!
049-21545	Fentress	-85.04819444	36.55127778	10483	922	#VAL-UE!	#VAL-UE!	603	-18	#VALUE!
049-21546	Fentress	-84.79330556	36.3255	10486	1435.3	219.3	160	59.3	#VAL-UE!	-10326
049-21547	Fentress	-85.08052778	36.42127778	10487	951	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
049-21548	Fentress	-84.80627778	36.33133333	10491	1521.9	241.9	142	99.9	#VAL-UE!	-10349
049-21549	Fentress	-84.80813889	36.33305556	10492	1538.8	143.8	45	98.8	#VAL-UE!	-10447
001-20101	Anderson	-84.34419444	36.06244444	10497	954	-1928	126	-2054	#VAL-UE!	-10371
049-21550	Fentress	-84.81088889	36.32908333	10498	1509.6	205.6	142	63.6	#VAL-UE!	-10356
151-21486	Scott	-84.49558333	36.35072222	10507	1881	-544	138	-682	-1763	-10369
151-21487	Scott	-84.47672222	36.34997222	10513	1856	-632	129	-761	-1793	-10384
001-20102	Anderson	-84.18191667	36.19536111	10516	1028.83	-1921.17	126	-2047.17	-3479.17	-10390
001-20103	Anderson	-84.37058333	36.10194444	10517	2109.3	-1665.7	137	-1802.7	#VAL-UE!	-10380

API	County	Longitude	Latitude	Permit	Elevation	Mfp SL	Mfp Iso	MDc SL	Od SL	MDc-Od Iso
001-20104	Anderson	-84.35097222	36.08141667	10522	1171	-1729	131	-1860	#VAL-UE!	-10391
001-20105	Anderson	-84.36527778	36.10727778	10523	2404	-1692	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
001-20106	Anderson	-84.36955556	36.11216667	10524	2389.3	-1668.7	129	-1797.7	#VAL-UE!	-10395
001-20107	Anderson	-84.37136111	36.10791667	10525	2024.8	-1735.2	138	-1873.2	#VAL-UE!	-10387
001-20108	Anderson	-84.36886111	36.11544444	10527	2382	-1659	140	-1799	#VAL-UE!	-10387
001-20109	Anderson	-84.36377778	36.11277778	10530	2380.4	-1692.6	137	-1829.6	#VAL-UE!	-10393
001-20110	Anderson	-84.37088889	36.10522222	10531	1838.2	-1667.8	139	-1806.8	#VAL-UE!	-10392
001-20111	Anderson	-84.34066667	36.08375	10532	1673	-1788	117	-1905	#VAL-UE!	-10415
001-20112	Anderson	-84.37347222	36.11394444	10535	2042	-1598	159	-1757	#VAL-UE!	-10376
001-20113	Anderson	-84.36652778	36.10525	10536	2107	-1671	170	-1841	#VAL-UE!	-10366
001-20114	Anderson	-84.33536111	36.08105556	10540	1309	-1783	118	-1901	#VAL-UE!	-10422
001-20115	Anderson	-84.36525	36.11747222	10544	2020	-1646	158	-1804	#VAL-UE!	-10386
001-20116	Anderson	-84.36763889	36.12422222	10548	1749	-1635	135	-1770	#VAL-UE!	-10413
001-20117	Anderson	-84.36833333	36.11975	10551	1968	-1626	156	-1782	#VAL-UE!	-10395
129-21724	Morgan	-84.4665	36.17280556	10559	2907	-1333	120	-1453	#VAL-UE!	-10439
129-21725	Morgan	-84.44430556	36.16783333	10560	2911	-1263	174	-1437	#VAL-UE!	-10386
001-20118	Anderson	-84.36958333	36.12916667	10561	2356	-1608	155	-1763	#VAL-UE!	-10406
049-21551	Fentress	-84.88255556	36.51111111	10568	979	529	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
049-21552	Fentress	-85.07108333	36.43677778	10569	861.3	#VAL-UE!	#VAL-UE!	556.3	-74.7	#VALUE!
049-21553	Fentress	-84.88402778	36.50980556	10578	1100	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
151-21488	Scott	-84.66883333	36.34425	10588	1380.1	-117.9	106	-223.9	#VAL-UE!	-10482
001-20119	Anderson	-84.31708333	36.08536111	10590	1096	-1842	162	-2004	#VAL-UE!	-10428
049-21554	Fentress	-84.89047222	36.50925	10591	1040	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
001-20120	Anderson	-84.29261111	36.09988889	10593	971.8	-1920.2	103	-2023.2	#VAL-UE!	-10490
151-21489	Scott	-84.64030556	36.32777778	10603	1414.2	-320.8	20	-340.8	#VAL-UE!	-10583
129-21726	Morgan	-84.47825	35.99472222	10604	766.9	-1693.1	126	-1819.1	#VAL-UE!	-10478
151-21490	Scott	-84.46269444	36.19294444	10605	2517.6	-1198.4	117	-1315.4	#VAL-UE!	-10488
001-20121	Anderson	-84.32494444	36.08713889	10607	1042.1	-1787.9	150	-1937.9	#VAL-UE!	-10457
049-21555	Fentress	-85.05322222	36.45930556	10608	957	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!

API	County	Longitude	Latitude	Permit	Elevation	Mfp SL	Mfp Iso	MDc SL	Od SL	MDc-Od Iso
129-21727	Morgan	-84.38463889	36.09338889	10613	2519.75	-1601.25	180	-1781.25	#VAL-UE!	-10433
129-21728	Morgan	-84.37927778	36.09097222	10614	2489	-1673	144	-1817	#VAL-UE!	-10470
129-21729	Morgan	-84.437	36.08236111	10617	2232.9	-1567.1	112	-1679.1	#VAL-UE!	-10505
001-20122	Anderson	-84.37175	36.09477778	10618	2839.9	-1659.1	162	-1821.1	#VAL-UE!	-10456
129-21730	Morgan	-84.38244444	36.09577778	10619	2853.4	-1624.6	158	-1782.6	#VAL-UE!	-10461
001-20123	Anderson	-84.36483333	36.13133333	10624	2353	-1635	138	-1773	#VAL-UE!	-10486
129-21731	Morgan	-84.47008333	35.99269444	10630	763.1	-1688.9	128	-1816.9	#VAL-UE!	-10502
129-21732	Morgan	-84.37636111	36.06497222	10631	1038.7	-1739.3	143	-1882.3	-3145.3	-10488
129-21733	Morgan	-84.38497222	36.05827778	10632	1229.3	-1749.7	146	-1895.7	-3125.7	-10486
049-21556	Fentress	-84.81302778	36.33463889	10634	1544.6	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
049-21557	Fentress	-85.05308333	36.45838889	10638	926	739	148	591	-94	-10490
049-21558	Fentress	-84.81088889	36.32908333	10642	1509.6	#VAL-UE!	#VAL-UE!	94.6	#VAL-UE!	#VALUE!
001-20124	Anderson	-84.33411111	36.05286111	10645	840.7	-2069.3	136	-2205.3	#VAL-UE!	-10509
001-20125	Anderson	-84.34433333	36.08108333	10646	1634	-1778	114	-1892	#VAL-UE!	-10532
049-21559	Fentress	-85.05358333	36.45855556	10652	946.1	#VAL-UE!	#VAL-UE!	603.1	-78.9	#VALUE!
049-21560	Fentress	-84.89180556	36.50772222	10653	1100	522	167	355	#VAL-UE!	-10486
049-21561	Fentress	-84.81427778	36.3245	10654	1527.4	#VAL-UE!	#VAL-UE!	107.4	#VAL-UE!	#VALUE!
001-20126	Anderson	-84.35622222	36.13288889	10657	2738	-1640	148	-1788	#VAL-UE!	-10509
001-20127	Anderson	-84.29563889	36.10305556	10658	1045.8	-1906.2	98	-2004.2	-3292.2	-10560
049-21562	Fentress	-85.07161111	36.44466667	10659	839	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
049-21563	Fentress	-84.89222222	36.50602778	10660	1142	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
049-21564	Fentress	-84.81286111	36.32675	10662	1503.7	#VAL-UE!	#VAL-UE!	93.7	#VAL-UE!	#VALUE!
049-21565	Fentress	-85.07	36.44452778	10663	836	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
049-21566	Fentress	-85.07658333	36.44133333	10665	862	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
001-20128	Anderson	-84.36075	36.13830556	10672	3133.5	-1623.5	147	-1770.5	#VAL-UE!	-10525
129-21734	Morgan	-84.47133333	36.2035	10673	2857	-1125	141	-1266	#VAL-UE!	-10532
129-21735	Morgan	-84.48663889	36.01283333	10676	1092.9	-1567.1	148	-1715.1	#VAL-UE!	-10528
001-20129	Anderson	-84.36916667	36.136	10678	3118	-1648	67	-1715	#VAL-UE!	-10611
151-21491	Scott	-84.46727778	36.21075	10679	3035	-1159	94	-1253	#VAL-UE!	-10585
049-21567	Fentress	-84.81547222	36.33525	10683	1554.9	#VAL-UE!	#VAL-UE!	129.9	#VAL-UE!	#VALUE!

API	County	Longitude	Latitude	Permit	Elevation	Mfp SL	Mfp Iso	MDc SL	Od SL	MDc-Od Iso
151-21492	Scott	-84.46522222	36.21736111	10684	2563	-1161	84	-1245	-2310	-10600
049-21568	Fentress	-85.05002778	36.46641667	10685	958	#VAL-UE!	#VAL-UE!	613	-19	#VALUE!
049-21569	Fentress	-85.04813889	36.54927778	10686	946	#VAL-UE!	#VAL-UE!	601	-30	#VALUE!
151-21493	Scott	-84.46302778	36.22619444	10687	2216	-1107	109	-1216	-2294	-10578
151-21494	Scott	-84.46813889	36.23286111	10688	2295	-1017	120	-1137	-2255	-10568
049-21570	Fentress	-85.01313889	36.56119444	10690	880	#VAL-UE!	#VAL-UE!	605	6	#VALUE!
151-21495	Scott	-84.46913889	36.19875	10695	2801.4	-1186.6	86	-1272.6	#VAL-UE!	-10609
049-21571	Fentress	-85.11158333	36.36872222	10697	1055.3	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
001-20130	Anderson	-84.31277778	36.08588889	10698	1399	-1903	127	-2030	#VAL-UE!	-10571
049-21572	Fentress	-84.89575	36.50841667	10700	1179	551	139	412	#VAL-UE!	-10561
129-21736	Morgan	-84.54219444	36.17569444	10701	1269	-929	106	-1035	#VAL-UE!	-10595
129-21737	Morgan	-84.53830556	36.18230556	10702	1281.6	-904.4	146	-1050.4	#VAL-UE!	-10556
151-21496	Scott	-84.43791667	36.16680556	10703	2649	-1298	172	-1470	#VAL-UE!	-10531
151-21497	Scott	-84.48791667	36.35927778	10704	1865.7	-570.3	156	-726.3	#VAL-UE!	-10548
049-21573	Fentress	-84.81733333	36.32783333	10706	1528	#VAL-UE!	#VAL-UE!	103	#VAL-UE!	#VALUE!
049-21574	Fentress	-84.81980556	36.32661111	10707	2000	#VAL-UE!	#VAL-UE!	560	#VAL-UE!	#VALUE!
049-21575	Fentress	-84.89669444	36.50683333	10708	1150	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
151-21498	Scott	-84.44733333	36.17630556	10711	2682.6	-1323.4	99	-1422.4	#VAL-UE!	-10612
001-20131	Anderson	-84.34213889	36.08733333	10713	1856.9	-1762.1	142	-1904.1	#VAL-UE!	-10571
001-20132	Anderson	-84.347	36.08575	10714	1755.5	-1769.5	129	-1898.5	#VAL-UE!	-10585
049-21576	Fentress	-84.96833333	36.30066667	10715	1718.8	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
129-21738	Morgan	-84.449	36.16844444	10716	2887	-1335	96	-1431	#VAL-UE!	-10620
129-21739	Morgan	-84.46075	36.17986111	10717	2640.5	-1273.5	104	-1377.5	#VAL-UE!	-10613
129-21740	Morgan	-84.46513889	36.17961111	10718	2292	-1223	133	-1356	#VAL-UE!	-10585
151-21499	Scott	-84.43986111	36.17194444	10719	2651	-1385	74	-1459	#VAL-UE!	-10645
049-21577	Fentress	-85.04641667	36.54944444	10724	924	#VAL-UE!	#VAL-UE!	584	-16	#VALUE!
049-21578	Fentress	-84.88947222	36.50769444	10725	1143	543	62	481	#VAL-UE!	-10663
129-21741	Morgan	-84.45619444	36.17136111	10726	2264.5	-1266.5	121	-1387.5	#VAL-UE!	-10605
129-21742	Morgan	-84.44252778	36.16152778	10727	2973	-1389	95	-1484	#VAL-UE!	-10632
129-21743	Morgan	-84.45841667	36.17491667	10728	2262.8	-1294.2	98	-1392.2	#VAL-UE!	-10630

API	County	Longitude	Latitude	Permit	Elevation	Mfp SL	Mfp Iso	MDc SL	Od SL	MDc-Od Iso
049-21579	Fentress	-84.81708333	36.32577778	10735	1521.8	#VAL-UE!	#VAL-UE!	91.8	#VAL-UE!	#VALUE!
049-21580	Fentress	-84.822	36.32277778	10736	1582.7	#VAL-UE!	#VAL-UE!	147.7	#VAL-UE!	#VALUE!
151-21529	Scott	-84.42847222	36.16677778	10737	2656	-1452	81	-1533	#VAL-UE!	-10656
129-21744	Morgan	-84.4455	36.16433333	10738	2976	-1324	124	-1448	#VAL-UE!	-10614
129-21745	Morgan	-84.49586111	36.17238889	10739	2830.2	-1159.8	106	-1265.8	#VAL-UE!	-10633
129-21746	Morgan	-84.54327778	36.18011111	10740	1378.4	-903.6	130	-1033.6	#VAL-UE!	-10610
049-21581	Fentress	-84.8875	36.50822222	10742	1075	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
001-20134	Anderson	-84.32475	36.07511111	10745	1047.1	-1902.9	116	-2018.9	#VAL-UE!	-10629
001-20135	Anderson	-84.34944444	36.07244444	10746	1058	-1762	125	-1887	#VAL-UE!	-10621
129-21747	Morgan	-84.44897222	36.16108333	10748	2332.9	-1357.1	94	-1451.1	#VAL-UE!	-10654
129-21748	Morgan	-84.53538889	36.17933333	10749	1365.7	-914.3	150	-1064.3	#VAL-UE!	-10599
129-21749	Morgan	-84.45436111	36.16766667	10751	2292.9	-1283.1	110	-1393.1	#VAL-UE!	-10641
049-21582	Fentress	-84.82116667	36.32086111	10753	1540.4	#VAL-UE!	#VAL-UE!	135.4	#VAL-UE!	#VALUE!
001-20136	Anderson	-84.3605	36.09488889	10755	2452.9	-1747.1	148	-1895.1	#VAL-UE!	-10607
001-20137	Anderson	-84.34266667	36.09441667	10756	2335.7	-1776.3	151	-1927.3	-3198.3	-10605
129-21750	Morgan	-84.49586111	36.17238889	10757	1312.6	-1127.4	114	-1241.4	-2307.4	-10643
001-20138	Anderson	-84.35663889	36.12736111	10758	2745	-1709	134	-1843	#VAL-UE!	-10624
001-20139	Anderson	-84.35908333	36.12958333	10759	3121.8	-1766.2	113	-1879.2	#VAL-UE!	-10646
001-20140	Anderson	-84.36286111	36.10416667	10763	2417.6	-1692.4	180	-1872.4	#VAL-UE!	-10583
049-21583	Fentress	-85.05169444	36.4585	10765	934.4	#VAL-UE!	#VAL-UE!	604.4	-60.6	#VALUE!
129-21751	Morgan	-84.45077778	36.16369444	10767	2298	-1340	104	-1444	#VAL-UE!	-10663
001-20141	Anderson	-84.396	36.10619444	10770	2880.1	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
001-20142	Anderson	-84.35144444	36.13197222	10771	2742.5	-1654.5	184	-1838.5	#VAL-UE!	-10587
049-21584	Fentress	-85.05483333	36.45316667	10777	906.2	#VAL-UE!	#VAL-UE!	566.2	-153.8	#VALUE!
049-21585	Fentress	-84.88563889	36.50869444	10781	1110	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
049-21586	Fentress	-84.82038889	36.31911111	10782	1530.4	#VAL-UE!	#VAL-UE!	125.4	#VAL-UE!	#VALUE!
049-21587	Fentress	-84.818	36.31727778	10783	1506.9	#VAL-UE!	#VAL-UE!	86.9	#VAL-UE!	#VALUE!
129-21752	Morgan	-84.48944444	36.16827778	10784	1302.04	-1141.96	136	-1277.96	-2353.96	-10648
049-21588	Fentress	-85.00041667	36.49755556	10788	1001.4	#VAL-UE!	#VAL-UE!	621.4	-13.6	#VALUE!
129-21753	Morgan	-84.48233333	36.17638889	10789	1377.58	-1142.42	148	-1290.42	#VAL-UE!	-10641

API	County	Longitude	Latitude	Permit	Elevation	Mfp SL	Mfp Iso	MDc SL	Od SL	MDc-Od Iso
129-21754	Morgan	-84.46211111	36.176	10790	2078.91	-1246.09	123	-1369.09	#VAL-UE!	-10667
129-21755	Morgan	-84.39316667	36.05369444	10791	1117.6	-1725.4	155	-1880.4	#VAL-UE!	-10636
129-21756	Morgan	-84.40752778	36.09516667	10792	1655.3	-1598.7	114	-1712.7	#VAL-UE!	-10678
001-20143	Anderson	-84.30988889	36.09913889	10797	1051.8	-1920.2	145	-2065.2	#VAL-UE!	-10652
129-21757	Morgan	-84.67022222	36.15616667	10798	1360.4	-380.6	86	-466.6	#VAL-UE!	-10712
129-21758	Morgan	-84.67302778	36.14986111	10799	1394.5	-345.5	114	-459.5	#VAL-UE!	-10685
001-20144	Anderson	-84.35186111	36.08680556	10800	1384.8	-1765.2	134	-1899.2	#VAL-UE!	-10666
001-20145	Anderson	-84.31475	36.09030556	10801	1594.4	-1849.6	120	-1969.6	#VAL-UE!	-10681
001-20146	Anderson	-84.34327778	36.09066667	10802	2089	-1771	142	-1913	#VAL-UE!	-10660
049-21589	Fentress	-84.81786111	36.33780556	10803	1551.1	#VAL-UE!	#VAL-UE!	121.1	#VAL-UE!	#VALUE!
049-21590	Fentress	-84.79558333	36.32291667	10804	1481.3	#VAL-UE!	#VAL-UE!	91.3	#VAL-UE!	#VALUE!
049-21591	Fentress	-84.78391667	36.32133333	10805	1502.4	#VAL-UE!	#VAL-UE!	72.4	#VAL-UE!	#VALUE!
129-21759	Morgan	-84.39163889	36.09925	10816	2397.4	-1627.6	110	-1737.6	-2908.6	-10706
129-21760	Morgan	-84.47511111	36.19244444	10817	2552.12	-1146.88	119	-1265.88	#VAL-UE!	-10698
129-21761	Morgan	-84.40277778	36.09516667	10818	1676.1	-1599.9	118	-1717.9	#VAL-UE!	-10700
001-20147	Anderson	-84.35063889	36.12452778	10819	2732.9	-1719.1	142	-1861.1	#VAL-UE!	-10677
001-20148	Anderson	-84.35177778	36.12061111	10820	2737.4	-1726.6	137	-1863.6	#VAL-UE!	-10683
129-21762	Morgan	-84.39138889	36.05761111	10821	1129.3	-1725.7	150	-1875.7	#VAL-UE!	-10671
129-21763	Morgan	-84.39594444	36.10183333	10822	2458.3	-1591.7	120	-1711.7	-2895.7	-10702
049-21592	Fentress	-85.06888889	36.40330556	10824	959.7	#VAL-UE!	#VAL-UE!	569.7	-35.3	#VALUE!
001-20149	Anderson	-84.34758333	36.13597222	10825	2340.4	-1699.6	149	-1848.6	#VAL-UE!	-10676
001-20150	Anderson	-84.33955556	36.12680556	10826	2739.6	-1761.4	148	-1909.4	#VAL-UE!	-10678
001-20151	Anderson	-84.34347222	36.13363889	10827	2347.9	-1750.1	120	-1870.1	#VAL-UE!	-10707
001-20152	Anderson	-84.33727778	36.13386111	10832	2310.2	-1781.8	104	-1885.8	#VAL-UE!	-10728
001-20153	Anderson	-84.35011111	36.14827778	10833	2344.49	-1673.51	150	-1823.51	#VAL-UE!	-10683
151-21500	Scott	-84.46811111	36.20711111	10834	3037.4	-1230.6	39	-1269.6	#VAL-UE!	-10795
001-20154	Anderson	-84.34272222	36.13	10835	2732.6	-1663.4	150	-1813.4	#VAL-UE!	-10685
001-20155	Anderson	-84.35575	36.13466667	10840	2721.2	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
001-20156	Anderson	-84.39402778	36.11202778	10843	2495.9	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!

API	County	Longitude	Latitude	Permit	Elevation	Mfp SL	Mfp Iso	MDc SL	Od SL	MDc-Od Iso
151-21501	Scott	-84.45908333	36.21086111	10845	2507.48	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
151-21502	Scott	-84.46083333	36.21505556	10846	2516.9	-1186.1	93	-1279.1	#VAL-UE!	-10753
151-21503	Scott	-84.45697222	36.21808333	10847	2503.45	-1188.55	90	-1278.55	#VAL-UE!	-10757
151-21504	Scott	-84.46013889	36.20788889	10848	2489.36	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
001-20157	Anderson	-84.36430556	36.07772222	10849	1056.9	-1719.1	126	-1845.1	#VAL-UE!	-10723
129-21764	Morgan	-84.3685	36.07644444	10850	1084.9	-1683.1	159	-1842.1	-3097.1	-10691
001-20158	Anderson	-84.34688889	36.13366667	10851	2749.1	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
151-21505	Scott	-84.46344444	36.23230556	10852	2633.2	-998.8	110	-1108.8	#VAL-UE!	-10742
001-20159	Anderson	-84.35441667	36.12377778	10853	2358	-1708	121	-1829	#VAL-UE!	-10732
001-20160	Anderson	-84.36225	36.12783333	10854	2346.1	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
001-20161	Anderson	-84.35961111	36.12497222	10855	2352.7	-1679.3	120	-1799.3	#VAL-UE!	-10735
001-20162	Anderson	-84.43630556	36.16163889	10856	2649	-1353	148	-1501	#VAL-UE!	-10708
129-21765	Morgan	-84.43144444	36.08458333	10866	2336.5	-1551.5	142	-1693.5	#VAL-UE!	-10724
129-21766	Morgan	-84.83519444	36.2	10867	1540	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
049-21593	Fentress	-85.08886111	36.38827778	10868	979.7	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
049-21594	Fentress	-85.09491667	36.39519444	10870	961.2	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
049-21595	Fentress	-85.04719444	36.54852778	10875	931.58	#VAL-UE!	#VAL-UE!	600.58	-41.42	#VALUE!
049-21596	Fentress	-85.06861111	36.45438889	10876	908	#VAL-UE!	#VAL-UE!	533	#VAL-UE!	#VALUE!
049-21597	Fentress	-85.11794444	36.36233333	10877	1105.7	#VAL-UE!	#VAL-UE!	535.7	-44.3	#VALUE!
001-20163	Anderson	-84.34894444	36.09488889	10878	2359.6	-1746.4	182	-1928.4	-3154.4	-10696
129-21767	Morgan	-84.62833333	36.22936111	10884	1666	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
129-21768	Morgan	-84.62794444	36.23183333	10885	1543	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
049-21598	Fentress	-84.82383333	36.33119444	10886	1523.7	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
001-20164	Anderson	-84.34466667	36.119	10887	2748.6	-1745.4	150	-1895.4	#VAL-UE!	-10737
001-20165	Anderson	-84.359	36.10880556	10888	2794.1	-1696.9	155	-1851.9	#VAL-UE!	-10733
151-21506	Scott	-84.45347222	36.23188889	10889	2502.7	-1127.3	116	-1243.3	#VAL-UE!	-10773
001-20166	Anderson	-84.33688889	36.12313889	10890	3098.9	-1793.1	135	-1928.1	#VAL-UE!	-10755
001-20167	Anderson	-84.33280556	36.12463889	10891	3192.7	-1799.3	122	-1921.3	#VAL-UE!	-10769
151-21507	Scott	-84.44905556	36.22997222	10892	2586.4	-1127.6	146	-1273.6	#VAL-UE!	-10746

API	County	Longitude	Latitude	Permit	Elevation	Mfp SL	Mfp Iso	MDc SL	Od SL	MDc-Od Iso
151-21508	Scott	-84.45352778	36.22402778	10893	2543.2	-1100.8	162	-1262.8	#VAL-UE!	-10731
151-21509	Scott	-84.45397222	36.22736111	10894	2502.5	-1147.5	97	-1244.5	#VAL-UE!	-10797
001-20168	Anderson	-84.35941667	36.10136111	10895	2811.7	-1820.3	40	-1860.3	#VAL-UE!	-10855
001-20169	Anderson	-84.33588889	36.13802778	10896	2342.4	-1727.6	128	-1855.6	#VAL-UE!	-10768
129-21769	Morgan	-84.48	36.01525	10897	1140.6	-1582.4	155	-1737.4	#VAL-UE!	-10742
049-21599	Fentress	-85.05102778	36.55047222	10901	950.24	#VAL-UE!	#VAL-UE!	604.24	-34.76	#VALUE!
049-21600	Fentress	-85.04602778	36.54691667	10902	908.51	#VAL-UE!	#VAL-UE!	594.51	-27.49	#VALUE!
049-21601	Fentress	-85.04730556	36.55041667	10903	921.73	#VAL-UE!	#VAL-UE!	604.73	-31.27	#VALUE!
129-21770	Morgan	-84.61608333	36.24713889	10905	1706	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
129-21771	Morgan	-84.61533333	36.24972222	10906	1613	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
129-21772	Morgan	-84.49172222	36.01652778	10908	1276.1	-1513.9	144	-1657.9	#VAL-UE!	-10764
049-21602	Fentress	-84.96852778	36.30291667	10909	1697.4	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
049-21603	Fentress	-84.96463889	36.30475	10910	1638.6	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
151-21510	Scott	-84.45755556	36.23769444	10915	2555.45	-1046.55	134	-1180.55	#VAL-UE!	-10781
049-21604	Fentress	-85.09191667	36.44808333	10927	908.2	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
049-21605	Fentress	-85.08605556	36.42375	10928	941.6	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
049-21606	Fentress	-85.08486111	36.42491667	10929	926.1	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
049-21607	Fentress	-85.08672222	36.42216667	10930	921.2	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
001-20170	Anderson	-84.33769444	36.08838889	10931	1741.6	-1778.4	136	-1914.4	#VAL-UE!	-10795
001-20171	Anderson	-84.34552778	36.08830556	10932	1973.6	-1766.4	139	-1905.4	#VAL-UE!	-10793
001-20172	Anderson	-84.32122222	36.08463889	10933	968	-1822	150	-1972	#VAL-UE!	-10783
049-21608	Fentress	-84.81088889	36.312	10934	1539.8	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
049-21609	Fentress	-84.81080556	36.314	10935	1514.2	#VAL-UE!	#VAL-UE!	104.2	#VAL-UE!	#VALUE!
001-20173	Anderson	-84.34775	36.06966667	10942	1063.7	-1766.3	128	-1894.3	#VAL-UE!	-10814
001-20174	Anderson	-84.31858333	36.08077778	10943	920.5	-1883.5	128	-2011.5	#VAL-UE!	-10815
049-21610	Fentress	-85.08155556	36.43663889	10944	839.3	#VAL-UE!	#VAL-UE!	527.3	-120.7	#VALUE!
049-21611	Fentress	-85.04844444	36.54819444	10950	937.95	#VAL-UE!	#VAL-UE!	615.95	-25.05	#VALUE!
049-21612	Fentress	-85.04455556	36.54752778	10951	962.53	#VAL-UE!	#VAL-UE!	657.53	31.53	#VALUE!
049-21613	Fentress	-84.99138889	36.38141667	10953	853.8	#VAL-UE!	#VAL-UE!	388.8	-443.2	#VALUE!

API	County	Longitude	Latitude	Permit	Elevation	Mfp SL	Mfp Iso	MDc SL	Od SL	MDc-Od Iso
049-21614	Fentress	-84.99252778	36.38197222	10954	836.1	#VAL-UE!	#VAL-UE!	396.1	-423.9	#VALUE!
049-21615	Fentress	-85.05625	36.44688889	10958	884	#VAL-UE!	#VAL-UE!	574	-71	#VALUE!
049-21616	Fentress	-84.81175	36.31591667	10960	1508.9	#VAL-UE!	#VAL-UE!	103.9	#VAL-UE!	#VALUE!
049-21617	Fentress	-84.81191667	36.31802778	10961	1501.3	#VAL-UE!	#VAL-UE!	101.3	-728.7	#VALUE!
049-21618	Fentress	-85.08030556	36.43755556	10966	862	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
049-21619	Fentress	-85.11327778	36.37477778	10967	1101.9	#VAL-UE!	#VAL-UE!	501.9	-108.1	#VALUE!
049-21620	Fentress	-85.04572222	36.55036111	10973	942	#VAL-UE!	#VAL-UE!	597	-26	#VALUE!
049-21621	Fentress	-84.81327778	36.31961111	10974	1481.8	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
129-21773	Morgan	-84.61861111	36.24286111	10976	1608	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
129-21774	Morgan	-84.61297222	36.24683333	10977	1688	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
049-21622	Fentress	-85.08427778	36.42625	10978	932.2	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
049-21623	Fentress	-85.08741667	36.42319444	10979	945.4	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
049-21624	Fentress	-85.09516667	36.45013889	10980	859.1	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
129-21775	Morgan	-84.60363889	36.07638889	10981	1366.9	-748.1	109	-857.1	-1940.1	-10872
129-21776	Morgan	-84.60366667	36.07266667	10982	1386.5	-748.5	109	-857.5	-1931.5	-10873
049-21625	Fentress	-85.04838889	36.54691667	10983	906.71	#VAL-UE!	#VAL-UE!	591.71	-31.29	#VALUE!
049-21626	Fentress	-85.04691667	36.54605556	10984	876.92	#VAL-UE!	#VAL-UE!	583.92	-41.08	#VALUE!
129-21777	Morgan	-84.55255556	36.17597222	10990	1397.5	-854.5	146	-1000.5	#VAL-UE!	-10844
129-21778	Morgan	-84.55719444	36.17502778	10991	1430.8	-833.2	150	-983.2	#VAL-UE!	-10841
001-20175	Anderson	-84.35383333	36.10194444	10992	2833.5	-1733.5	151	-1884.5	#VAL-UE!	-10841
001-20176	Anderson	-84.35411111	36.10572222	10993	2798.2	-1748.8	139	-1887.8	#VAL-UE!	-10854
129-21779	Morgan	-84.39822222	36.05213889	10994	1175.1	-1702.9	157	-1859.9	#VAL-UE!	-10837
129-21780	Morgan	-84.39844444	36.05802778	10995	1201	-1677	180	-1857	-3041	-10815
049-21627	Fentress	-84.82552778	36.32563889	10996	1584.7	#VAL-UE!	#VAL-UE!	124.7	#VAL-UE!	#VALUE!
049-21628	Fentress	-84.82780556	36.32652778	10997	1575.1	#VAL-UE!	#VAL-UE!	135.1	#VAL-UE!	#VALUE!
129-21781	Morgan	-84.42788889	36.08094444	11003	2453.5	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
049-21629	Fentress	-85.08472222	36.43772222	11004	905	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
049-21630	Fentress	-85.085	36.43905556	11006	876	#VAL-UE!	#VAL-UE!	#VAL-UE!	-91	#VALUE!
001-20177	Anderson	-84.35838889	36.0725	11007	982.7	-1717.3	120	-1837.3	#VAL-UE!	-10887
049-21631	Fentress	-84.83011111	36.32666667	11008	1572.2	#VAL-UE!	#VAL-UE!	147.2	#VAL-UE!	#VALUE!

API	County	Longitude	Latitude	Permit	Elevation	Mfp SL	Mfp Iso	MDc SL	Od SL	MDc-Od Iso
049-21632	Fentress	-84.82697222	36.33169444	11009	1508.2	#VAL-UE!	#VAL-UE!	158.2	#VAL-UE!	#VALUE!
049-21633	Fentress	-85.0435	36.54616667	11016	872.17	#VAL-UE!	#VAL-UE!	527.17	-95.83	#VALUE!
049-21634	Fentress	-85.04483333	36.54636111	11017	885.95	#VAL-UE!	#VAL-UE!	548.95	-76.05	#VALUE!
049-21635	Fentress	-85.04825	36.54580556	11018	905.49	#VAL-UE!	#VAL-UE!	596.49	-31.51	#VALUE!
049-21636	Fentress	-85.07797222	36.42908333	11019	901.2	#VAL-UE!	#VAL-UE!	#VAL-UE!	-46.8	#VALUE!
049-21637	Fentress	-85.11208333	36.37561111	11020	1082.6	#VAL-UE!	#VAL-UE!	522.6	-62.4	#VALUE!
129-21782	Morgan	-84.5465	36.17458333	11021	1350.4	-875.6	145	-1020.6	#VAL-UE!	-10876
129-21783	Morgan	-84.53727778	36.17172222	11022	1283.3	-930.7	135	-1065.7	#VAL-UE!	-10887
129-21784	Morgan	-84.54769444	36.17927778	11023	1440.6	-876.4	146	-1022.4	#VAL-UE!	-10877
001-20178	Anderson	-84.35055556	36.11708333	11024	2335.7	-1786.3	79	-1865.3	#VAL-UE!	-10945
001-20179	Anderson	-84.35202778	36.09872222	11025	2833.5	-1784.5	132	-1916.5	#VAL-UE!	-10893
001-20180	Anderson	-84.33305556	36.12863889	11026	3144.5	-1817.5	106	-1923.5	#VAL-UE!	-10920
001-20181	Anderson	-84.34786111	36.13077778	11027	3115.3	-1712.7	134	-1846.7	-3038.7	-10893
049-21638	Fentress	-84.828	36.32463889	11030	1563.1	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
049-21639	Fentress	-84.82986111	36.32258333	11031	1469.2	#VAL-UE!	#VAL-UE!	124.2	#VAL-UE!	#VALUE!
049-21640	Fentress	-85.04547222	36.54402778	11034	902.44	#VAL-UE!	#VAL-UE!	574.44	-45.56	#VALUE!
049-21641	Fentress	-85.04658333	36.54469444	11035	898.42	#VAL-UE!	#VAL-UE!	578.42	-49.58	#VALUE!
129-21785	Morgan	-84.65913889	36.29505556	11036	1449.1	-246.9	76	-322.9	#VAL-UE!	-10960
129-21786	Morgan	-84.486	36.16497222	11042	1395.6	-1139.4	136	-1275.4	#VAL-UE!	-10906
129-21787	Morgan	-84.616	36.24144444	11043	1659	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
129-21788	Morgan	-84.61538889	36.23908333	11044	1603	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
129-21789	Morgan	-84.66669444	35.98475	11045	1325.5	-724.5	160	-884.5	-1934.5	-10885
001-20182	Anderson	-84.31966667	36.08666667	11046	1030.9	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
001-20183	Anderson	-84.19011111	36.12825	11049	954.1	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
001-20184	Anderson	-84.17855556	36.12711111	11055	1108.6	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
035-20200	Cumber-land	-84.9775	36.0175	11060	1844.2	192.2	148	44.2	-763.8	-10912
049-21642	Fentress	-85.04727778	36.54755556	11061	885.98	#VAL-UE!	#VAL-UE!	600.98	-31.02	#VALUE!
049-21643	Fentress	-85.08152778	36.43805556	11062	858	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
001-20185	Anderson	-84.17863889	36.19413889	11066	1068.8	-1926.2	105	-2031.2	#VAL-UE!	-10961

API	County	Longitude	Latitude	Permit	Elevation	Mfp SL	Mfp Iso	MDc SL	Od SL	MDc-Od Iso
001-20186	Anderson	-84.17683333	36.19533333	11067	1045.3	-1909.7	107	-2016.7	#VAL-UE!	-10960
001-20187	Anderson	-84.17869444	36.19733333	11068	1182.3	-1962.7	97	-2059.7	#VAL-UE!	-10971
001-20188	Anderson	-84.18375	36.19877778	11069	1343.4	-1956.6	103	-2059.6	#VAL-UE!	-10966
049-21644	Fentress	-85.04597222	36.54802778	11070	313.83	#VAL-UE!	#VAL-UE!	8.83	-626.17	#VALUE!
001-20189	Anderson	-84.15777778	36.15444444	11075	1042.9	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
129-21790	Morgan	-84.40333333	36.05452778	11076	1197	-1655	194	-1849	-3037	-10882
129-21791	Morgan	-84.40713889	36.05027778	11077	1175.2	-1702.8	117	-1819.8	-3040.8	-10960
001-20190	Anderson	-84.32941667	36.10094444	11078	2419.5	-1776.5	144	-1920.5	-3204.5	-10934
049-21645	Fentress	-85.04538889	36.54519444	11079	899.41	#VAL-UE!	#VAL-UE!	561.41	-65.59	#VALUE!
001-20191	Anderson	-84.33386111	36.09855556	11080	2416.4	-1783.6	140	-1923.6	#VAL-UE!	-10940
001-20192	Anderson	-84.33375	36.14141667	11081	2323.5	-1714.5	134	-1848.5	#VAL-UE!	-10947
001-20193	Anderson	-84.33241667	36.13452778	11082	2745.6	-1769.4	128	-1897.4	#VAL-UE!	-10954
049-21646	Fentress	-85.08605556	36.43738889	11085	936	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
049-21647	Fentress	-85.04394444	36.53880556	11090	938.1	#VAL-UE!	#VAL-UE!	563.1	-112.9	#VALUE!
049-21648	Fentress	-85.041	36.54122222	11091	942.4	#VAL-UE!	#VAL-UE!	642.4	37.4	#VALUE!
129-21792	Morgan	-84.55016667	36.18397222	11092	1436.5	-862.5	142	-1004.5	#VAL-UE!	-10950
049-21649	Fentress	-85.08358333	36.43663889	11104	896.9	#VAL-UE!	#VAL-UE!	-1023.1	#VAL-UE!	#VALUE!
049-21650	Fentress	-85.05177778	36.45933333	11113	935.9	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
151-21511	Scott	-84.59444444	36.34177778	11116	1450.3	-387.7	82	#REF!	#VAL-UE!	#REF!
151-21512	Scott	-84.59391667	36.33925	11117	1406.1	-357.9	118	-475.9	#VAL-UE!	-10999
151-21513	Scott	-84.59413889	36.33744444	11118	1384.3	-353.7	120	-473.7	#VAL-UE!	-10998
151-21514	Scott	-84.44805556	36.25966667	11123	2573.3	-947.7	115	-1062.7	-2136.7	-11008
151-21515	Scott	-84.44622222	36.26294444	11124	2540.4	-951.6	108	-1059.6	#VAL-UE!	-11016
151-21516	Scott	-84.44966667	36.25472222	11125	2530.4	-968.6	117	-1085.6	#VAL-UE!	-11008
151-21517	Scott	-84.4525	36.25205556	11126	2613	-1010	143	-1153	#VAL-UE!	-10983
151-21518	Scott	-84.45866667	36.24377778	11127	2621.5	-963.5	125	-1088.5	#VAL-UE!	-11002
129-21793	Morgan	-84.47547222	36.19819444	11128	2768	-1156	94	-1250	#VAL-UE!	-11034
129-21794	Morgan	-84.48847222	36.1975	11129	2878.7	-1127.3	87	-1214.3	#VAL-UE!	-11042
001-20194	Anderson	-84.32336111	36.13827778	11130	2704.9	-2085.1	160	-2245.1	#VAL-UE!	-10970
001-20195	Anderson	-84.32516667	36.13486111	11131	2724.1	-1789.9	125	-1914.9	#VAL-UE!	-11006

API	County	Longitude	Latitude	Permit	Elevation	Mfp SL	Mfp Iso	MDc SL	Od SL	MDc-Od Iso
129-21795	Morgan	-84.48516667	36.19402778	11134	2835.8	-1112.2	114	-1226.2	#VAL-UE!	-11020
129-21796	Morgan	-84.65988889	36.28416667	11139	1460.17	-225.83	108	-333.83	#VAL-UE!	-11031
129-21797	Morgan	-84.66125	36.29033333	11140	1414.68	-183.32	112	-295.32	#VAL-UE!	-11028
151-21519	Scott	-84.59402778	36.34341667	11141	1445.5	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
001-20196	Anderson	-84.32972222	36.14055556	11142	2301.7	-1756.3	114	-1870.3	#VAL-UE!	-11028
151-21520	Scott	-84.44383333	36.21913889	11151	1516.1	-1207.9	110	-1317.9	-2391.9	-11041
001-20197	Anderson	-84.42897222	36.15463889	11152	2661.8	-1418.2	115	-1533.2	#VAL-UE!	-11037
001-20198	Anderson	-84.43327778	36.15583333	11153	2707.8	-1388.2	140	-1528.2	#VAL-UE!	-11013
001-20199	Anderson	-84.41783333	36.15280556	11154	2679.3	-1434.7	153	-1587.7	#VAL-UE!	-11001
001-20200	Anderson	-84.42302778	36.15252778	11155	2700.4	-1409.6	155	-1564.6	#VAL-UE!	-11000
129-21798	Morgan	-84.86716667	36.19994444	11161	1565	169	126	43	#VAL-UE!	-11035
151-21521	Scott	-84.43283333	36.22794444	11162	1420.9	-1182.1	137	-1319.1	-2439.1	-11025
001-20201	Anderson	-84.18272222	36.19194444	11164	1035.5	-1914.5	113	-2027.5	#VAL-UE!	-11051
001-20202	Anderson	-84.33597222	36.11952778	11165	3266.3	-1800.7	149	-1949.7	#VAL-UE!	-11016
001-20203	Anderson	-84.19838889	36.23316667	11166	1327.8	-1777.2	135	-1912.2	#VAL-UE!	-11031
049-21651	Fentress	-85.04563889	36.544	11167	888.84	#VAL-UE!	#VAL-UE!	562.84	-57.16	#VALUE!
001-20204	Anderson	-84.32041667	36.14797222	11172	2283.8	-1741.2	143	-1884.2	#VAL-UE!	-11029
001-20205	Anderson	-84.32330556	36.14208333	11173	2344.6	-1778.4	110	-1888.4	#VAL-UE!	-11063
151-21522	Scott	-84.44869444	36.22597222	11174	2187.3	-1132.7	152	-1284.7	-2380.7	-11022
151-21523	Scott	-84.44972222	36.21341667	11175	1610.7	-1167.3	135	-1302.3	#VAL-UE!	-11040
151-21524	Scott	-84.44572222	36.21597222	11177	1567.8	-1233.2	96	-1329.2	#VAL-UE!	-11081
151-21525	Scott	-84.43905556	36.22158333	11178	1481.1	-1181.9	126	-1307.9	#VAL-UE!	-11052
049-21652	Fentress	-85.07661111	36.4245	11180	830.4	#VAL-UE!	#VAL-UE!	530.4	-120.6	#VALUE!
001-20206	Anderson	-84.319	36.14005556	11183	2756.6	-1781.4	130	-1911.4	#VAL-UE!	-11053
049-21653	Fentress	-85.08061111	36.41941667	11186	882.7	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
151-21526	Scott	-84.45180556	36.24061111	11188	2533.5	257.5	124	133.5	#VAL-UE!	-11064
129-21799	Morgan	-84.61969444	36.24841667	11189	1576	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
001-20207	Anderson	-84.19719444	36.23786111	11190	1269.7	-1730.3	135	-1865.3	#VAL-UE!	-11055
129-21800	Morgan	-84.38311111	36.0445	11193	886.3	-1893.7	119	-2012.7	-3228.7	-11074
129-21801	Morgan	-84.37516667	36.046	11194	827.6	-1932.4	130	-2062.4	-3264.4	-11064

API	County	Longitude	Latitude	Permit	Elevation	Mfp SL	Mfp Iso	MDc SL	Od SL	MDc-Od Iso
151-21527	Scott	-84.46316667	36.20313889	11196	2223.9	-1140.1	151	-1291.1	#VAL-UE!	-11045
151-21528	Scott	-84.43411111	36.224	11199	1420.1	-1188.9	135	-1323.9	#VAL-UE!	-11064
001-20208	Anderson	-84.35522222	36.1105	11200	2348.1	-1712.9	144	-1856.9	#VAL-UE!	-11056
129-21802	Morgan	-84.38011111	36.04725	11202	956.2	-1909.8	118	-2027.8	#VAL-UE!	-11084
129-21803	Morgan	-84.64988889	36.31213889	11203	1378.5	-273.5	114	-387.5	#VAL-UE!	-11089
001-20209	Anderson	-84.35572222	36.13438889	11205	2721.2	-1657.8	151	-1808.8	#VAL-UE!	-11054
151-21533	Scott	-84.45061111	36.24925	11206	2642.9	-960.1	136	-1096.1	#VAL-UE!	-11070
049-21654	Fentress	-85.00161111	36.43641667	11207	918	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
049-21655	Fentress	-84.97033333	36.30183333	11208	1721.4	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
129-21805	Morgan	-84.38830556	36.06102778	11209	1074.6	-1735.4	130	-1865.4	#VAL-UE!	-11079
129-21806	Morgan	-84.38327778	36.06155556	11210	1244.1	-1750.9	126	-1876.9	-3105.9	-11084
129-21807	Morgan	-84.39136111	36.04241667	11211	1117.4	-1762.6	186	-1948.6	-3192.6	-11025
129-21808	Morgan	-84.39294444	36.04605556	11212	1136.3	-1747.7	150	-1897.7	-3135.7	-11062
049-21656	Fentress	-85.04605556	36.54255556	11214	912.41	#VAL-UE!	#VAL-UE!	562.41	-4.59	#VALUE!
035-20201	Cumber-land	-84.72038889	35.95275	11215	1603.3	-498.7	149	-647.7	-1678.7	-11066
129-21809	Morgan	-84.66861111	35.98916667	11217	1391.4	-650.6	152	-802.6	#VAL-UE!	-11065
129-21810	Morgan	-84.67438889	35.95830556	11218	1358	-992	124	-1116	#VAL-UE!	-11094
001-20210	Anderson	-84.36408333	36.07402778	11219	1002.2	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
151-21530	Scott	-84.38602778	36.36463889	11223	1586	#VAL-UE!	#VAL-UE!	-984	#VAL-UE!	#VALUE!
129-21811	Morgan	-84.36919444	36.07977778	11224	1232	-1713	143	-1856	-3102	-11081
129-21812	Morgan	-84.65886111	36.29286111	11225	1447.14	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
001-20211	Anderson	-84.31472222	36.15344444	11226	2689.1	-1742.9	174	-1916.9	#VAL-UE!	-11052
001-20212	Anderson	-84.31697222	36.13833333	11227	2748.4	-1782.6	145	-1927.6	#VAL-UE!	-11082
001-20213	Anderson	-84.31216667	36.14641667	11228	2681.1	-1806.9	129	-1935.9	#VAL-UE!	-11099
129-21813	Morgan	-84.49991667	36.01408333	11229	1091.7	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
129-21814	Morgan	-84.48711111	36.01591667	11230	1300.2	-1563.8	121	-1684.8	#VAL-UE!	-11109
001-20242	Anderson	-84.361	36.08155556	11233	1288	-1723	132	-1855	-3114	-11101
001-20214	Anderson	-84.35513889	36.1405	11234	2708	-1656	122	-1778	#VAL-UE!	-11112
129-21816	Morgan	-84.36986111	36.06130556	11236	1020.6	-1805.4	140	-1945.4	-3201.4	-11096
129-21817	Morgan	-84.37619444	36.06094444	11237	905.9	-1860.1	129	-1989.1	#VAL-UE!	-11108
129-21818	Morgan	-84.38272222	36.08388889	11238	2255.6	-1694.4	120	-1814.4	#VAL-UE!	-11118

API	County	Longitude	Latitude	Permit	Elevation	Mfp SL	Mfp Iso	MDc SL	Od SL	MDc-Od Iso
129-21819	Morgan	-84.38008333	36.08016667	11239	1946.1	-1677.9	144	-1821.9	-3043.9	-11095
001-20215	Anderson	-84.37286111	36.14038889	11240	2718.7	-1615.3	131	-1746.3	#VAL-UE!	-11109
151-21531	Scott	-84.44822222	36.24883333	11244	2608.1	-858.9	119	-977.9	#VAL-UE!	-11125
129-21820	Morgan	-84.38033333	36.03580556	11245	860.1	-1999.9	110	-2109.9	#VAL-UE!	-11135
129-21821	Morgan	-84.48875	36.01866667	11247	1258.2	-1506.8	159	-1665.8	#VAL-UE!	-11088
151-21532	Scott	-84.44186111	36.22658333	11248	2178.9	-1164.1	143	-1307.1	#VAL-UE!	-11105
129-21822	Morgan	-84.82819444	36.20005556	11250	1534	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
129-21823	Morgan	-84.64358333	35.95519444	11255	1367.2	-1090.8	137	-1227.8	#VAL-UE!	-11118
129-21824	Morgan	-84.38836111	36.03008333	11256	1004.8	-1965.2	120	-2085.2	-3302.2	-11136
129-21825	Morgan	-84.38388889	36.03294444	11257	995.7	-1954.3	150	-2104.3	#VAL-UE!	-11107
129-21826	Morgan	-84.49797222	36.19958333	11258	2862.6	-1046.4	130	-1176.4	#VAL-UE!	-11128
129-21827	Morgan	-84.49344444	36.19908333	11259	2894.3	-1074.7	98	-1172.7	#VAL-UE!	-11161
001-20216	Anderson	-84.41036111	36.14961111	11260	2656.4	-1503.6	130	-1633.6	#VAL-UE!	-11130
001-20217	Anderson	-84.44116667	36.15338889	11261	2992.8	-1365.2	130	-1495.2	#VAL-UE!	-11131
001-20218	Anderson	-84.44136111	36.15777778	11262	3002.3	-1364.7	130	-1494.7	#VAL-UE!	-11132
001-20219	Anderson	-84.43794444	36.15461111	11263	2995.1	-1390.9	123	-1513.9	#VAL-UE!	-11140
001-20220	Anderson	-84.43038889	36.16269444	11264	2649.7	-1389.3	133	-1522.3	#VAL-UE!	-11131
001-20221	Anderson	-84.30975	36.11911111	11269	2317.5	-1853.5	122	-1975.5	#VAL-UE!	-11147
001-20222	Anderson	-84.31988889	36.10477778	11270	2405.6	-1830.4	124	-1954.4	#VAL-UE!	-11146
001-20223	Anderson	-84.31297222	36.11591667	11271	2329.4	-1843.6	128	-1971.6	#VAL-UE!	-11143
151-21534	Scott	-84.45611111	36.21155556	11272	2206.1	-1172.9	129	-1301.9	#VAL-UE!	-11143
049-21657	Fentress	-85.02033333	36.40075	11273	871.9	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
049-21658	Fentress	-85.03527778	36.55030556	11274	812	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
129-21828	Morgan	-84.47963889	36.19155556	11276	2910	-1141	79	-1220	#VAL-UE!	-11197
001-20224	Anderson	-84.32036111	36.09708333	11277	2099.3	-1826.7	128	-1954.7	#VAL-UE!	-11149
001-20225	Anderson	-84.31577778	36.1005	11278	2117.7	-1838.3	106	-1944.3	#VAL-UE!	-11172
129-21829	Morgan	-84.37908333	36.0765	11279	1711.6	-1688.4	140	-1828.4	#VAL-UE!	-11139
049-21659	Fentress	-85.012	36.43291667	11282	895.2	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
049-21660	Fentress	-85.03638889	36.54533333	11284	875.9	#VAL-UE!	#VAL-UE!	553.9	-59.1	#VALUE!

API	County	Longitude	Latitude	Permit	Elevation	Mfp SL	Mfp Iso	MDc SL	Od SL	MDc-Od Iso
129-21830	Morgan	-84.49408333	36.02036111	11285	1264.3	-1495.7	126	-1621.7	#VAL-UE!	-11159
129-21831	Morgan	-84.49383333	36.01322222	11286	1274.9	-1497.1	154	-1651.1	#VAL-UE!	-11132
129-21832	Morgan	-84.48502778	36.19019444	11287	2866.3	-1114.7	127	-1241.7	#VAL-UE!	-11160
129-21833	Morgan	-84.48811111	36.18758333	11288	2873.5	-1110.5	118	-1228.5	#VAL-UE!	-11170
129-21834	Morgan	-84.49066667	36.19241667	11291	2843.2	-1091.8	132	-1223.8	#VAL-UE!	-11159
129-21835	Morgan	-84.50136111	36.20186111	11292	2690	-998	142	-1140	#VAL-UE!	-11150
129-21836	Morgan	-84.3805	36.06644444	11293	999.8	-1710.2	146	-1856.2	-3108.2	-11147
151-21535	Scott	-84.47552778	36.20527778	11296	2637	-1115	129	-1244	#VAL-UE!	-11167
151-21536	Scott	-84.45183333	36.20883333	11297	1668.3	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
151-21537	Scott	-84.47066667	36.24980556	11298	1440.6	-899.4	110	-1009.4	#VAL-UE!	-11188
151-21538	Scott	-84.43658333	36.23036111	11299	1509.5	-1168.5	127	-1295.5	#VAL-UE!	-11172
151-21539	Scott	-84.44013889	36.23277778	11300	1642.8	-1156.2	128	-1284.2	#VAL-UE!	-11172
151-21540	Scott	-84.44458333	36.23558333	11302	1815.8	-1226.2	58	-1284.2	#VAL-UE!	-11244
129-21837	Morgan	-84.37475	36.05775	11303	889	-1861	120	-1981	#VAL-UE!	-11183
151-21541	Scott	-84.46547222	36.24511111	11306	2208.5	-901.5	140	-1041.5	#VAL-UE!	-11166
151-21542	Scott	-84.46986111	36.24430556	11307	2033.7	-888.3	128	-1016.3	#VAL-UE!	-11179
001-20226	Anderson	-84.31958333	36.09358333	11308	1871.6	-1858.4	100	-1958.4	#VAL-UE!	-11208
129-21838	Morgan	-84.49325	36.21166667	11309	2603.5	-1026.5	118	-1144.5	#VAL-UE!	-11191
129-21839	Morgan	-84.49727778	36.21002778	11310	2718.1	-1017.9	134	-1151.9	#VAL-UE!	-11176
151-21543	Scott	-84.44319444	36.24202778	11311	2508.1	-1042.9	126	-1168.9	#VAL-UE!	-11185
151-21544	Scott	-84.43922222	36.24030556	11312	2582.4	-1067.6	130	-1197.6	#VAL-UE!	-11182
151-21545	Scott	-84.43544444	36.23836111	11313	2588.7	-1111.3	130	-1241.3	#VAL-UE!	-11183
151-21546	Scott	-84.43147222	36.23669444	11314	2563.7	-1196.3	94	-1290.3	#VAL-UE!	-11220
129-21840	Morgan	-84.37936111	36.05527778	11315	1496.2	-1853.8	120	-1973.8	-3198.8	-11195
129-21841	Morgan	-84.38336111	36.05430556	11316	1526.4	-1823.6	120	-1943.6	-3151.6	-11196
129-21842	Morgan	-84.38075	36.05863889	11317	1447.2	-1788.8	129	-1917.8	-3196.8	-11188
129-21843	Morgan	-84.37586111	36.04969444	11318	945.1	-1904.9	150	-2054.9	-3259.9	-11168
049-21661	Fentress	-85.09072222	36.41919444	11319	918.4	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
049-21662	Fentress	-85.08613889	36.43608333	11322	935.5	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
001-20227	Anderson	-84.36566667	36.08744444	11324	2029.6	-1738.4	112	-1850.4	#VAL-UE!	-11212

API	County	Longitude	Latitude	Permit	Elevation	Mfp SL	Mfp Iso	MDc SL	Od SL	MDc-Od Iso
001-20228	Anderson	-84.36155556	36.08755556	11325	2019.7	-1780.3	100	-1880.3	#VAL-UE!	-11225
049-21663	Fentress	-84.80194444	36.31833333	11327	1463.4	227.4	158	69.4	-809.6	-11169
049-21664	Fentress	-84.80677778	36.3175	11328	1484.7	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
001-20229	Anderson	-84.3495	36.06708333	11332	1042.4	-1803.6	126	-1929.6	#VAL-UE!	-11206
129-21844	Morgan	-84.36158333	36.06811111	11333	960.5	-1789.5	74	-1863.5	#VAL-UE!	-11259
001-20230	Anderson	-84.31558333	36.09552778	11336	1833.3	-1850.7	116	-1966.7	-3295.7	-11220
001-20231	Anderson	-84.31122222	36.09533333	11337	1684.1	-1681.9	121	-1802.9	-3117.9	-11216
001-20232	Anderson	-84.307	36.09408333	11338	1498.5	-2031.5	120	-2151.5	-3446.5	-11218
129-21845	Morgan	-84.67177778	35.98469444	11341	1374	#VAL-UE!	#VAL-UE!	-830	#VAL-UE!	#VALUE!
129-21846	Morgan	-84.66366667	35.99033333	11342	1374.7	-710.3	135	-845.3	#VAL-UE!	-11207
151-21547	Scott	-84.47452778	36.252	11344	1409.9	-890.1	110	-1000.1	#VAL-UE!	-11234
151-21548	Scott	-84.47475	36.24830556	11345	1412.6	-877.4	130	-1007.4	#VAL-UE!	-11215
129-21847	Morgan	-84.39252778	36.06597222	11349	1667.2	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
129-21848	Morgan	-84.38986111	36.06869444	11350	1639.7	-1710.3	100	-1810.3	#VAL-UE!	-11250
129-21849	Morgan	-84.3705	36.04636111	11351	807.9	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
151-21549	Scott	-84.47469444	36.24461111	11352	1464.6	-865.4	140	-1005.4	#VAL-UE!	-11212
129-21850	Morgan	-84.38841667	36.03463889	11356	1125.7	-1934.3	120	-2054.3	#VAL-UE!	-11236
129-21851	Morgan	-84.499	36.19652778	11357	2854.7	-1060.3	115	-1175.3	#VAL-UE!	-11242
151-21550	Scott	-84.43780556	36.25808333	11358	2535.2	-1042.8	80	-1122.8	#VAL-UE!	-11278
151-21551	Scott	-84.43016667	36.25269444	11359	2314.6	-1045.4	98	-1143.4	#VAL-UE!	-11261
001-20233	Anderson	-84.38802778	36.10891667	11361	2045.6	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
001-20234	Anderson	-84.38791667	36.11947222	11362	1882.1	-1627.9	110	-1737.9	#VAL-UE!	-11252
001-20235	Anderson	-84.39336111	36.12038889	11363	1994.6	-1615.4	110	-1725.4	#VAL-UE!	-11253
001-20236	Anderson	-84.30075	36.09888889	11364	1613	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
001-20237	Anderson	-84.30563889	36.09769444	11365	1613.6	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
001-20238	Anderson	-84.40602778	36.15091667	11366	2688.8	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
151-21552	Scott	-84.44272222	36.25922222	11367	2593.2	-976.8	150	-1126.8	#VAL-UE!	-11217
129-21852	Morgan	-84.39283333	36.03094444	11368	1155.6	-1922.4	122	-2044.4	#VAL-UE!	-11246
001-20239	Anderson	-84.34538889	36.07138889	11369	1170.4	-1779.6	122	-1901.6	#VAL-UE!	-11247
049-21665	Fentress	-85.00211111	36.43116667	11371	682	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!

API	County	Longitude	Latitude	Permit	Elevation	Mfp SL	Mfp Iso	MDc SL	Od SL	MDc-Od Iso
001-20240	Anderson	-84.39563889	36.12330556	11375	1937.2	-1672.8	120	-1792.8	#VAL-UE!	-11255
001-20241	Anderson	-84.40069444	36.12172222	11376	1594.5	-1589.5	116	-1705.5	#VAL-UE!	-11260
151-21553	Scott	-84.54786111	36.45061111	11377	1470	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
129-21853	Morgan	-84.50608333	36.20463889	11380	2936.5	-993.5	120	-1113.5	#VAL-UE!	-11260
129-21854	Morgan	-84.50011111	36.20766667	11381	2651.5	-1008.5	110	-1118.5	#VAL-UE!	-11271
129-21855	Morgan	-84.412	36.09538889	11382	1661	-1593	116	-1709	#VAL-UE!	-11266
001-20243	Anderson	-84.31966667	36.08666667	11383	1030.9	-1824.1	155	-1979.1	#VAL-UE!	-11228
001-20244	Anderson	-84.21577778	36.22386111	11384	2156.1	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
001-20245	Anderson	-84.22002778	36.22538889	11385	2194.6	-1773.4	138	-1911.4	#VAL-UE!	-11247
001-20246	Anderson	-84.21183333	36.22316667	11386	2052.6	-1797.4	131	-1928.4	#VAL-UE!	-11255
151-21554	Scott	-84.47697222	36.25444444	11390	1362	-858	120	-978	#VAL-UE!	-11270
151-21555	Scott	-84.50216667	36.22205556	11391	2518.1	-871.9	110	-981.9	#VAL-UE!	-11281
151-21556	Scott	-84.49819444	36.21997222	11392	2726.8	-921.2	112	-1033.2	#VAL-UE!	-11280
151-21557	Scott	-84.50222222	36.21852778	11393	2667.1	-882.9	130	-1012.9	#VAL-UE!	-11263
151-21558	Scott	-84.47594444	36.23122222	11394	1481.4	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
129-21856	Morgan	-84.50352778	36.21497222	11395	2634.1	-895.9	80	-975.9	#VAL-UE!	-11315
129-21857	Morgan	-84.51025	36.20144444	11396	2711.2	-968.8	120	-1088.8	#VAL-UE!	-11276
129-21858	Morgan	-84.50363889	36.21041667	11397	2769.3	-950.7	134	-1084.7	-2110.7	-11263
001-20247	Anderson	-84.32475	36.07877778	11402	1184.4	-1865.6	130	-1995.6	#VAL-UE!	-11272
001-20248	Anderson	-84.32227778	36.0705	11403	847.3	-1944.7	136	-2080.7	#VAL-UE!	-11267
001-20249	Anderson	-84.32275	36.07319444	11404	870.2	-1929.8	126	-2055.8	#VAL-UE!	-11278
001-20250	Anderson	-84.28663889	36.12469444	11408	2194.5	-1891.5	126	-2017.5	#VAL-UE!	-11282
001-20251	Anderson	-84.29775	36.12391667	11409	2359	-1871	104	-1975	#VAL-UE!	-11305
001-20252	Anderson	-84.29113889	36.12197222	11410	2280.4	-1889.6	120	-2009.6	#VAL-UE!	-11290
001-20253	Anderson	-84.29661111	36.12041667	11411	2231.3	-1868.7	110	-1978.7	#VAL-UE!	-11301
001-20254	Anderson	-84.30136111	36.12075	11412	2349.5	-1880.5	110	-1990.5	#VAL-UE!	-11302
001-20255	Anderson	-84.29072222	36.12402778	11413	2381.2	-1888.8	100	-1988.8	#VAL-UE!	-11313
151-21559	Scott	-84.43341667	36.25547222	11414	2277.6	-1042.4	90	-1132.4	#VAL-UE!	-11324
151-21560	Scott	-84.44547222	36.26580556	11419	2531.7	-956.3	111	-1067.3	-2116.3	-11308

API	County	Longitude	Latitude	Permit	Elevation	Mfp SL	Mfp Iso	MDc SL	Od SL	MDc-Od Iso
129-21859	Morgan	-84.49172222	36.01666667	11422	1277.9	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
129-21860	Morgan	-84.48863889	36.01847222	11423	1261.8	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
151-21561	Scott	-84.64880556	36.31447222	11424	1293.4	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
151-21562	Scott	-84.48980556	36.22333333	11428	2672.2	-965.8	112	-1077.8	#VAL-UE!	-11316
151-21563	Scott	-84.49436111	36.22208333	11429	2717.1	-952.9	100	-1052.9	#VAL-UE!	-11329
151-21564	Scott	-84.43627778	36.27161111	11430	2611.4	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
151-21565	Scott	-84.45780556	36.27627778	11431	2347	-903	110	-1013	#VAL-UE!	-11321
151-21566	Scott	-84.45583333	36.27286111	11432	2559	-921	110	-1031	#VAL-UE!	-11322
151-21567	Scott	-84.48863889	36.22722222	11433	2745.9	-924.1	110	-1034.1	#VAL-UE!	-11323
129-21861	Morgan	-84.66961111	35.9825	11434	1336.6	-728.4	158	-886.4	#VAL-UE!	-11276
129-21862	Morgan	-84.38561111	36.06480556	11439	1509.9	-1720.1	130	-1850.1	-3101.1	-11309
001-20256	Anderson	-84.25733333	36.11472222	11440	1666.4	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
001-20257	Anderson	-84.25563889	36.11155556	11441	1631.8	-2008.2	108	-2116.2	-3498.2	-11333
129-21863	Morgan	-84.39694444	36.03105556	11442	1190.5	-1909.5	120	-2029.5	#VAL-UE!	-11322
001-20258	Anderson	-84.27086111	36.10255556	11443	1021	-2039	70	-2109	-3469	-11373
001-20259	Anderson	-84.27886111	36.10461111	11444	917	-1929	144	-2073	-3418	-11300
001-20260	Anderson	-84.26088889	36.10127778	11445	1561.1	-2088.9	150	-2238.9	#VAL-UE!	-11295
001-20261	Anderson	-84.25630556	36.10786111	11446	1642.1	-2067.9	80	-2147.9	#VAL-UE!	-11366
001-20262	Anderson	-84.25961111	36.10486111	11447	1632.6	-2057.4	100	-2157.4	#VAL-UE!	-11347
001-20263	Anderson	-84.27219444	36.09936111	11448	938.1	-2061.9	85	-2146.9	-3493.9	-11363
001-20264	Anderson	-84.25830556	36.11783333	11449	1553.6	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
129-21864	Morgan	-84.40613889	36.07527778	11450	2509.6	-1650.4	110	-1760.4	#VAL-UE!	-11340
129-21865	Morgan	-84.40180556	36.07658333	11451	2575.5	-1654.5	110	-1764.5	#VAL-UE!	-11341
001-20265	Anderson	-84.25883333	36.12247222	11453	1757.5	-1972.5	90	-2062.5	-3457.5	-11363
001-20266	Anderson	-84.18997222	36.18352778	11456	1037.7	-1912.3	125	-2037.3	#VAL-UE!	-11331
001-20267	Anderson	-84.20108333	36.17902778	11457	1433.4	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
001-20268	Anderson	-84.19608333	36.18283333	11458	1029.4	-1950.6	112	-2062.6	#VAL-UE!	-11346
049-21666	Fentress	-85.07541667	36.44958333	11460	867.4	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
151-21568	Scott	-84.59761111	36.32297222	11461	1359	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
151-21569	Scott	-84.59772222	36.31788889	11462	1425	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
151-21570	Scott	-84.59802778	36.34436111	11463	1370	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!

API	County	Longitude	Latitude	Permit	Elevation	Mfp SL	Mfp Iso	MDc SL	Od SL	MDc-Od Iso
151-21571	Scott	-84.59702778	36.31969444	11464	1435	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
129-21866	Morgan	-84.67808333	35.9575	11465	1378.6	-973.4	140	-1113.4	#VAL-UE!	-11325
129-21867	Morgan	-84.67375	35.95469444	11466	1388.2	-1001.8	136	-1137.8	#VAL-UE!	-11330
001-20269	Anderson	-84.18608333	36.18386111	11467	1106.7	-1883.3	119	-2002.3	#VAL-UE!	-11348
129-21868	Morgan	-84.80797222	36.142	11469	1425	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
129-21869	Morgan	-84.39733333	36.07666667	11472	2256.9	-1693.1	110	-1803.1	#VAL-UE!	-11362
129-21870	Morgan	-84.39777778	36.0715	11473	2236.1	-1683.9	110	-1793.9	#VAL-UE!	-11363
151-21572	Scott	-84.48577778	36.23791667	11474	2253.3	-896.7	100	-996.7	#VAL-UE!	-11374
151-21573	Scott	-84.48780556	36.23111111	11475	2650.9	-899.1	100	-999.1	#VAL-UE!	-11375
151-21574	Scott	-84.48372222	36.23375	11476	2248.2	-901.8	110	-1011.8	#VAL-UE!	-11366
001-20270	Anderson	-84.19875	36.17163889	11477	967.6	-1987.4	115	-2102.4	#VAL-UE!	-11362
049-21667	Fentress	-84.77527778	36.34683333	11479	1504.1	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
151-21575	Scott	-84.46558333	36.27966667	11480	2257.9	-892.1	100	-992.1	#VAL-UE!	-11380
001-20271	Anderson	-84.30227778	36.104	11481	1243.5	-1896.5	150	-2046.5	-3330.5	-11331
151-21576	Scott	-84.55186111	36.44966667	11482	1494.7	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
001-20272	Anderson	-84.30869444	36.10841667	11484	1551.3	-1898.7	100	-1998.7	#VAL-UE!	-11384
001-20273	Anderson	-84.29736111	36.10566667	11485	1149.3	-1880.7	120	-2000.7	-3330.7	-11365
001-20274	Anderson	-84.31286111	36.10941667	11486	1733.1	-1856.9	120	-1976.9	#VAL-UE!	-11366
129-21871	Morgan	-84.393	36.03491667	11489	1144.1	-1895.9	120	-2015.9	#VAL-UE!	-11369
001-20275	Anderson	-84.30486111	36.10669444	11490	1385.1	-1876.9	122	-1998.9	-3302.9	-11368
129-21872	Morgan	-84.40144444	36.03055556	11491	1180.7	-1869.3	110	-1979.3	#VAL-UE!	-11381
151-21577	Scott	-84.50425	36.22855556	11492	2381.8	-848.2	110	-958.2	#VAL-UE!	-11382
001-20276	Anderson	-84.29886111	36.10897222	11493	1224.7	-1905.3	120	-2025.3	-3333.3	-11373
151-21578	Scott	-84.48302778	36.24069444	11494	2210	-880	110	-990	#VAL-UE!	-11384
151-21579	Scott	-84.47419444	36.22741667	11495	1540.6	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
151-21580	Scott	-84.4855	36.24405556	11496	2172.5	-867.5	120	-987.5	#VAL-UE!	-11376
001-20277	Anderson	-84.35575	36.08708333	11501	1836.6	-1763.4	123	-1886.4	#VAL-UE!	-11378
129-21873	Morgan	-84.68052778	35.99113889	11502	1509.8	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
129-21874	Morgan	-84.673	35.98727778	11503	1404.4	-619.6	156	-775.6	#VAL-UE!	-11347
129-21875	Morgan	-84.68066667	35.98747222	11504	1518.7	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!

API	County	Longitude	Latitude	Permit	Elevation	Mfp SL	Mfp Iso	MDc SL	Od SL	MDc-Od Iso
129-21876	Morgan	-84.67722222	35.98897222	11505	1446.5	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
001-20278	Anderson	-84.35194444	36.08380556	11508	1373.7	-1750.3	126	-1876.3	#VAL-UE!	-11382
001-20279	Anderson	-84.34938889	36.07947222	11509	1120.9	-1724.1	135	-1859.1	#VAL-UE!	-11374
129-21877	Morgan	-84.38844444	36.08441667	11513	2450.9	-1699.1	120	-1819.1	#VAL-UE!	-11393
129-21878	Morgan	-84.39780556	36.08630556	11514	2370.8	-1659.2	110	-1769.2	#VAL-UE!	-11404
129-21879	Morgan	-84.39416667	36.08425	11515	2477.6	-1632.4	160	-1792.4	#VAL-UE!	-11355
001-20280	Anderson	-84.22897222	36.14488889	11516	1676.5	-2073.5	96	-2169.5	-3548.5	-11420
129-21880	Morgan	-84.40102778	36.08941667	11517	2244.6	-1623.4	112	-1735.4	#VAL-UE!	-11405
129-21881	Morgan	-84.39630556	36.08022222	11518	2343.5	-1660.5	126	-1786.5	#VAL-UE!	-11392
001-20281	Anderson	-84.22763889	36.14844444	11519	1665.1	-2024.9	115	-2139.9	-3519.9	-11404
001-20282	Anderson	-84.22394444	36.14491667	11520	1607.1	-2090.9	104	-2194.9	#VAL-UE!	-11416
049-21668	Fentress	-85.08036111	36.43613889	11521	838.3	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
151-21581	Scott	-84.59219444	36.35386111	11522	1391.4	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
151-21582	Scott	-84.50441667	36.23275	11524	2366.8	-783.2	100	-883.2	#VAL-UE!	-11424
151-21583	Scott	-84.50227778	36.23761111	11525	2223.1	-846.9	104	-950.9	-1996.9	-11421
151-21584	Scott	-84.48777778	36.24963889	11526	1791.5	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
151-21585	Scott	-84.48225	36.24775	11527	2007.4	-872.6	105	-977.6	#VAL-UE!	-11422
151-21586	Scott	-84.48408333	36.25216667	11528	1783.7	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
151-21587	Scott	-84.48755556	36.25419444	11529	1772.3	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
001-20283	Anderson	-84.23327778	36.14338889	11534	1713.4	-2051.6	90	-2141.6	-3518.6	-11444
001-20284	Anderson	-84.22966667	36.14130556	11535	1551	-2099	90	-2189	-3551	-11445
001-20285	Anderson	-84.19277778	36.23183333	11536	1081.6	-1808.4	114	-1922.4	#VAL-UE!	-11422
001-20286	Anderson	-84.21419444	36.154	11544	1574.4	-2011.6	118	-2129.6	#VAL-UE!	-11426
001-20287	Anderson	-84.21755556	36.14736111	11545	1591.8	-2048.2	100	-2148.2	#VAL-UE!	-11445
001-20288	Anderson	-84.21736111	36.15111111	11546	1532.7	-2045.3	118	-2163.3	-3591.3	-11428
001-20289	Anderson	-84.21997222	36.13991667	11547	1594.4	-2065.6	100	-2165.6	#VAL-UE!	-11447
001-20290	Anderson	-84.21980556	36.14338889	11548	1593.3	-2066.7	100	-2166.7	#VAL-UE!	-11448
001-20291	Anderson	-84.23422222	36.16261111	11552	1910.8	-1949.2	100	-2049.2	#VAL-UE!	-11452
001-20292	Anderson	-84.2325	36.16561111	11553	1883.7	-1906.3	140	-2046.3	#VAL-UE!	-11413
001-20293	Anderson	-84.22811111	36.16463889	11554	1701	-1939	100	-2039	#VAL-UE!	-11454
001-20294	Anderson	-84.31727778	36.06488889	11556	831.8	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!

API	County	Longitude	Latitude	Permit	Elevation	Mfp SL	Mfp Iso	MDc SL	Od SL	MDc-Od Iso
001-20295	Anderson	-84.35147222	36.06991667	11557	1091.5	-1763.5	113	-1876.5	#VAL-UE!	-11444
001-20296	Anderson	-84.22261111	36.21841667	11558	2599.3	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
001-20297	Anderson	-84.21744444	36.22058333	11559	2191.5	-1788.5	134	-1922.5	#VAL-UE!	-11425
001-20298	Anderson	-84.19041667	36.19013889	11560	1389.3	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
001-20299	Anderson	-84.18886111	36.18658333	11561	1316.7	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
001-20300	Anderson	-84.24222222	36.14008333	11562	1735.7	-1984.3	114	-2098.3	-3479.3	-11448
049-21669	Fentress	-85.06019444	36.42969444	11563	685.4	#VAL-UE!	#VAL-UE!	537.4	-109.6	#VALUE!
049-21670	Fentress	-85.06122222	36.43038889	11564	685.2	670.2	142	528.2	-126.8	-11422
049-21671	Fentress	-85.06241667	36.43155556	11565	682.4	#VAL-UE!	#VAL-UE!	534.4	-112.6	#VALUE!
001-20301	Anderson	-84.30219444	36.11152778	11566	1393.6	-1928.4	103	-2031.4	#VAL-UE!	-11463
001-20302	Anderson	-84.25013889	36.13330556	11567	1743.7	-1976.3	120	-2096.3	#VAL-UE!	-11447
001-20303	Anderson	-84.24230556	36.13561111	11568	1597.7	-2002.3	100	-2102.3	#VAL-UE!	-11468
001-20304	Anderson	-84.24688889	36.13758333	11569	1768.7	-1961.3	120	-2081.3	#VAL-UE!	-11449
129-21882	Morgan	-84.53722222	36.18677778	11570	1254.8	-925.2	100	-1025.2	#VAL-UE!	-11470
129-21883	Morgan	-84.53508333	36.19058333	11571	1272.6	-921.4	110	-1031.4	#VAL-UE!	-11461
049-21672	Fentress	-85.01988889	36.40788889	11573	939	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
001-20305	Anderson	-84.33694444	36.05713889	11574	930	-1995	144	-2139	#VAL-UE!	-11430
001-20306	Anderson	-84.34033333	36.05502778	11575	1038.7	-1976.3	132	-2108.3	#VAL-UE!	-11443
001-20307	Anderson	-84.21072222	36.156	11578	1588.2	-2011.8	110	-2121.8	#VAL-UE!	-11468
001-20308	Anderson	-84.25858333	36.13258333	11579	1707.5	-1992.5	110	-2102.5	#VAL-UE!	-11469
001-20309	Anderson	-84.25191667	36.13027778	11580	1743.4	-1956.6	130	-2086.6	-3434.6	-11450
001-20310	Anderson	-84.24691667	36.131	11581	1609.7	-2000.3	70	-2070.3	#VAL-UE!	-11511
001-20311	Anderson	-84.20977778	36.15261111	11582	1572.1	-1997.9	100	-2097.9	#VAL-UE!	-11482
001-20312	Anderson	-84.38661111	36.11561111	11583	1958.1	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
001-20313	Anderson	-84.31291667	36.08597222	11585	1400	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
001-20314	Anderson	-84.23152778	36.158	11588	1688.5	-1951.5	100	-2051.5	#VAL-UE!	-11488
001-20315	Anderson	-84.22694444	36.15927778	11589	1659.3	-1970.7	100	-2070.7	#VAL-UE!	-11489
001-20316	Anderson	-84.23030556	36.16133333	11590	1698.5	-1941.5	160	-2101.5	-3439.5	-11430
001-20317	Anderson	-84.23344444	36.14747222	11591	1723.8	-2036.2	80	-2116.2	#VAL-UE!	-11511
001-20318	Anderson	-84.23191667	36.15075	11592	1707	-2058	95	-2153	-3474	-11497

API	County	Longitude	Latitude	Permit	Elevation	Mfp SL	Mfp Iso	MDc SL	Od SL	MDc-Od Iso
129-21884	Morgan	-84.48783333	35.99255556	11596	1017.1	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
001-20319	Anderson	-84.25244444	36.11463889	11597	1635.2	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
001-20320	Anderson	-84.25458333	36.10480556	11598	1546.9	-2103.1	100	-2203.1	#VAL-UE!	-11498
001-20321	Anderson	-84.25411111	36.12186111	11599	1625.1	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
001-20322	Anderson	-84.22808333	36.15541667	11600	1684.7	-1967.3	108	-2075.3	#VAL-UE!	-11492
001-20323	Anderson	-84.22619444	36.21452778	11602	2627.3	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
001-20324	Anderson	-84.22180556	36.22333333	11603	2600.7	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
001-20325	Anderson	-84.20161111	36.23775	11604	1652.2	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
129-21885	Morgan	-84.48552778	35.99566667	11607	1020.9	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
151-21588	Scott	-84.60433333	36.293	11608	1478	-450	105	-555	#VAL-UE!	-11503
151-21589	Scott	-84.60152778	36.29588889	11609	1525.68	-508.32	106	-614.32	#VAL-UE!	-11503
001-20326	Anderson	-84.26052778	36.12566667	11611	1725.6	-1984.4	88	-2072.4	#VAL-UE!	-11523
001-20327	Anderson	-84.27908333	36.13061111	11612	2420.8	-1909.2	130	-2039.2	#VAL-UE!	-11482
001-20328	Anderson	-84.28841667	36.13927778	11613	2343.1	-1872.9	114	-1986.9	#VAL-UE!	-11499
001-20329	Anderson	-84.24844444	36.10913889	11614	1571.5	-2128.5	100	-2228.5	#VAL-UE!	-11514
001-20330	Anderson	-84.29411111	36.12744444	11615	2766.1	-1863.9	115	-1978.9	#VAL-UE!	-11500
001-20331	Anderson	-84.27430556	36.13069444	11616	2432.4	-1957.6	120	-2077.6	#VAL-UE!	-11496
001-20332	Anderson	-84.28802778	36.13013889	11617	2385.4	-1864.6	120	-1984.6	#VAL-UE!	-11497
001-20333	Anderson	-84.25075	36.10613889	11618	1577.5	-2114.5	124	-2238.5	#VAL-UE!	-11494
001-20334	Anderson	-84.26466667	36.10361111	11619	1534.7	-2023.3	134	-2157.3	#VAL-UE!	-11485
001-20335	Anderson	-84.25722222	36.10161111	11620	1541.1	-2118.9	106	-2224.9	#VAL-UE!	-11514
001-20336	Anderson	-84.26522222	36.09991667	11621	1492.7	-2067.3	124	-2191.3	#VAL-UE!	-11497
001-20337	Anderson	-84.23680556	36.13722222	11622	1628.8	-2039.2	114	-2153.2	-3514.2	-11508
001-20338	Anderson	-84.29205556	36.13119444	11624	2874.3	-1851.7	125	-1976.7	#VAL-UE!	-11499
001-20339	Anderson	-84.27391667	36.10722222	11626	897.9	-1952.1	110	-2062.1	-3417.1	-11516
001-20340	Anderson	-84.28133333	36.10725	11627	968.6	-1927.4	117	-2044.4	-3385.4	-11510
001-20341	Anderson	-84.23344444	36.13516667	11628	1585.5	-2070.5	124	-2194.5	#VAL-UE!	-11504
001-20342	Anderson	-84.29261111	36.13583333	11630	3057.4	-1852.6	119	-1971.6	#VAL-UE!	-11511
001-20343	Anderson	-84.27019444	36.13419444	11632	2256.4	-1953.6	100	-2053.6	#VAL-UE!	-11532
001-20344	Anderson	-84.23177778	36.13841667	11633	1556	-2073	123	-2196	#VAL-UE!	-11510

API	County	Longitude	Latitude	Permit	Elevation	Mfp SL	Mfp Iso	MDc SL	Od SL	MDc-Od Iso
001-20345	Anderson	-84.22930556	36.13463889	11634	1577.6	-2121.4	119	-2240.4	#VAL-UE!	-11515
001-20346	Anderson	-84.35705556	36.08983333	11639	2046.3	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
129-21886	Morgan	-84.48486111	35.99144444	11642	902.7	-1689.3	114	-1803.3	#VAL-UE!	-11528
129-21887	Morgan	-84.48983333	35.99588889	11643	954.4	-1665.6	100	-1765.6	#VAL-UE!	-11543
049-21673	Fentress	-85.06227778	36.43430556	11645	701.3	#VAL-UE!	#VAL-UE!	581.3	-50.7	#VALUE!
049-21674	Fentress	-85.06002778	36.43141667	11646	869.4	674.4	143	531.4	-120.6	-11503
001-20347	Anderson	-84.22241667	36.13338889	11648	1467.6	-2152.4	74	-2226.4	#VAL-UE!	-11574
001-20348	Anderson	-84.28030556	36.12530556	11649	2215.4	-1938.6	104	-2042.6	#VAL-UE!	-11545
001-20349	Anderson	-84.22802778	36.13002778	11650	1501.3	-2130.7	122	-2252.7	#VAL-UE!	-11528
001-20350	Anderson	-84.28305556	36.12830556	11651	2199.5	-1898.5	112	-2010.5	#VAL-UE!	-11539
001-20351	Anderson	-84.32816667	36.07252778	11654	1016.7	-1883.3	123	-2006.3	#VAL-UE!	-11531
001-20352	Anderson	-84.3555	36.07466667	11656	1111.9	-1688.1	194	-1882.1	-3154.1	-11462
049-21675	Fentress	-85.03325	36.36569444	11659	824.9	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
151-21590	Scott	-84.584	36.29505556	11660	1681	-527	110	-637	#VAL-UE!	-11550
151-21591	Scott	-84.60380556	36.2915	11661	1484.7	-445.3	105	-550.3	#VAL-UE!	-11556
129-21888	Morgan	-84.83908333	36.13952778	11665	1598	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
129-21889	Morgan	-84.39641667	36.09388889	11667	1687.1	-1584.9	156	-1740.9	#VAL-UE!	-11511
001-20353	Anderson	-84.29675	36.13908333	11671	2374.5	-1841.5	126	-1967.5	#VAL-UE!	-11545
001-20354	Anderson	-84.29891667	36.13602778	11672	2305	-1935	40	-1975	#VAL-UE!	-11632
001-20355	Anderson	-84.29722222	36.13236111	11673	2320.3	-1879.7	85	-1964.7	#VAL-UE!	-11588
001-20356	Anderson	-84.293	36.14119444	11674	2323.8	-1926.2	50	-1976.2	#VAL-UE!	-11624
001-20357	Anderson	-84.31355556	36.15836111	11675	2686.4	-1768.6	153	-1921.6	#VAL-UE!	-11522
001-20358	Anderson	-84.27422222	36.12202778	11676	1756.2	-1963.8	100	-2063.8	#VAL-UE!	-11576
001-20359	Anderson	-84.2825	36.11361111	11677	1576.4	-1973.6	64	-2037.6	-3359.6	-11613
001-20360	Anderson	-84.28166667	36.11763889	11678	1729.7	-1950.3	110	-2060.3	-3352.3	-11568
001-20361	Anderson	-84.27208333	36.11916667	11679	1738.7	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
001-20362	Anderson	-84.36019444	36.07077778	11680	1048.4	-1718.6	130	-1848.6	#VAL-UE!	-11550
151-21592	Scott	-84.59780556	36.29258333	11681	1637.77	-436.23	116	-552.23	#VAL-UE!	-11565
151-21593	Scott	-84.48408333	36.25216667	11682	1783.7	-876.3	110	-986.3	#VAL-UE!	-11572
151-21594	Scott	-84.47055556	36.22594444	11684	1683.4	-992.6	176	-1168.6	#VAL-UE!	-11508

API	County	Longitude	Latitude	Permit	Elevation	Mfp SL	Mfp Iso	MDc SL	Od SL	MDc-Od Iso
129-21890	Morgan	-84.83508333	36.13416667	11687	1588.2	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
151-21595	Scott	-84.58333333	36.29355556	11688	1612.44	-471.56	116	-587.56	#VAL-UE!	-11572
151-21596	Scott	-84.50205556	36.24186111	11691	2175.5	-844.5	105	-949.5	#VAL-UE!	-11586
151-21597	Scott	-84.48777778	36.24963889	11692	1791.5	-878.5	105	-983.5	#VAL-UE!	-11587
151-21598	Scott	-84.48755556	36.25419444	11693	1772.3	-857.7	110	-967.7	#VAL-UE!	-11583
129-21891	Morgan	-84.48530556	35.99575	11697	1018.6	-1711.4	90	-1801.4	#VAL-UE!	-11607
001-20363	Anderson	-84.21366667	36.20133333	11698	2235.7	-1874.3	90	-1964.3	#VAL-UE!	-11608
001-20364	Anderson	-84.20438889	36.17425	11699	1538	-2012	95	-2107	#VAL-UE!	-11604
001-20365	Anderson	-84.22058333	36.19430556	11700	2236.3	-1863.7	128	-1991.7	#VAL-UE!	-11572
001-20366	Anderson	-84.21680556	36.19633333	11701	2179.7	-1900.3	96	-1996.3	#VAL-UE!	-11605
151-21599	Scott	-84.59611111	36.29375	11703	1711.58	-482.42	116	-598.42	#VAL-UE!	-11587
129-21892	Morgan	-84.82705556	36.14258333	11704	1580	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
001-20367	Anderson	-84.2155	36.17922222	11706	2138	-1902	120	-2022	#VAL-UE!	-11586
001-20368	Anderson	-84.21355556	36.17633333	11707	1912.3	-1939.7	112	-2051.7	#VAL-UE!	-11595
001-20369	Anderson	-84.20766667	36.20069444	11708	1979.2	-1870.8	90	-1960.8	#VAL-UE!	-11618
001-20370	Anderson	-84.21277778	36.20505556	11709	2247.2	-1848.8	112	-1960.8	#VAL-UE!	-11597
001-20371	Anderson	-84.20325	36.19972222	11710	1951	-1804	131	-1935	#VAL-UE!	-11579
001-20372	Anderson	-84.20702778	36.21136111	11711	1897.2	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
001-20373	Anderson	-84.2055	36.20763889	11712	1991.8	-1838.2	100	-1938.2	#VAL-UE!	-11612
001-20374	Anderson	-84.2115	36.20891667	11713	1929.7	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
001-20375	Anderson	-84.20013889	36.20561111	11714	2277.7	-1842.3	110	-1952.3	#VAL-UE!	-11604
001-20376	Anderson	-84.19841667	36.2135	11715	2272.5	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
001-20377	Anderson	-84.19433333	36.2	11716	1984.8	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
001-20378	Anderson	-84.35705556	36.08983333	11720	2046.3	-1753.7	160	-1913.7	#VAL-UE!	-11560
001-20379	Anderson	-84.20169444	36.238	11721	1636.5	-1773.5	110	-1883.5	#VAL-UE!	-11611
001-20380	Anderson	-84.19027778	36.19016667	11723	1382.3	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
001-20381	Anderson	-84.20966667	36.174	11724	1659.6	-1962.4	123	-2085.4	-3479.4	-11601
001-20382	Anderson	-84.18886111	36.18658333	11725	1316.7	-1919.3	102	-2021.3	#VAL-UE!	-11623
001-20383	Anderson	-84.20138889	36.20952778	11726	2217.1	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!

API	County	Longitude	Latitude	Permit	Elevation	Mfp SL	Mfp Iso	MDc SL	Od SL	MDc-Od Iso
001-20384	Anderson	-84.20108333	36.17902778	11727	1433.4	-1986.6	100	-2086.6	-3489.6	-11627
049-21676	Fentress	-85.05302778	36.42625	11730	842.1	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
035-20202	Cumber-land	-85.17791667	36.02597222	11731	1963.7	611.7	159	452.7	#VAL-UE!	-11572
035-20203	Cumber-land	-85.17986111	36.02819444	11732	1939.1	517.1	43	474.1	#VAL-UE!	-11689
129-21893	Morgan	-84.73688889	36.14588889	11735	1368.3	-219.7	90	-309.7	#VAL-UE!	-11645
129-21894	Morgan	-84.73291667	36.171	11736	1371.2	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
049-21677	Fentress	-85.04941667	36.43169444	11738	903.3	728.3	149	579.3	-22.7	-11589
049-21678	Fentress	-85.06138889	36.43527778	11739	695.7	525.7	160	365.7	-229.3	-11579
049-21679	Fentress	-85.033	36.36233333	11740	837.6	557.6	175	382.6	-365.4	-11565
129-21895	Morgan	-84.59872222	36.25397222	11741	1595.2	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
049-21680	Fentress	-85.04380556	36.41988889	11742	880.7	700.7	150	550.7	-39.3	-11592
049-21681	Fentress	-85.03113889	36.36097222	11743	823.7	573.7	170	403.7	-319.3	-11573
001-20385	Anderson	-84.19480556	36.18858333	11745	1196.5	-1873.5	166	-2039.5	-3439.5	-11579
129-21896	Morgan	-84.49205556	36.02586111	11746	1268.2	-1534.8	92	-1626.8	#VAL-UE!	-11654
001-20386	Anderson	-84.20561111	36.18072222	11747	1223.7	-1968.3	87	-2055.3	#VAL-UE!	-11660
129-21897	Morgan	-84.49063889	36.02258333	11748	1222.8	-1521.2	107	-1628.2	#VAL-UE!	-11641
129-21898	Morgan	-84.49844444	36.01572222	11750	1268.5	-1491.5	122	-1613.5	#VAL-UE!	-11628
129-21899	Morgan	-84.49969444	36.01938889	11751	1264.8	-1485.2	100	-1585.2	#VAL-UE!	-11651
049-21682	Fentress	-85.04627778	36.35213889	11752	939.3	#VAL-UE!	#VAL-UE!	394.3	-410.7	#VALUE!
129-21900	Morgan	-84.48730556	36.00380556	11758	1195.4	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
129-21901	Morgan	-84.47844444	36.00655556	11759	1297.6	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
001-20387	Anderson	-84.19905556	36.19588889	11765	1522.8	-1829.2	122	-1951.2	#VAL-UE!	-11643
001-20388	Anderson	-84.19825	36.19247222	11766	1301.3	-1878.7	75	-1953.7	#VAL-UE!	-11691
001-20389	Anderson	-84.19908333	36.2005	11767	2003.2	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
129-21902	Morgan	-84.483	36.00533333	11770	1240.5	-1643.5	106	-1749.5	#VAL-UE!	-11664
151-21600	Scott	-84.39327778	36.48647222	11771	2346.8	-565.2	136	-701.2	#VAL-UE!	-11635
151-21601	Scott	-84.39505556	36.47958333	11772	2087.1	-556.9	134	-690.9	#VAL-UE!	-11638
151-21602	Scott	-84.39436111	36.49019444	11773	2406.3	-551.7	134	-685.7	#VAL-UE!	-11639
151-21603	Scott	-84.38869444	36.50138889	11774	2151.9	-520.1	144	-664.1	#VAL-UE!	-11630
049-21683	Fentress	-85.017	36.54144444	11776	979.3	#VAL-UE!	#VAL-UE!	595.3	-54.7	#VALUE!
151-21604	Scott	-84.59772222	36.28455556	11777	1425	-420	102	-522	#VAL-UE!	-11675

API	County	Longitude	Latitude	Permit	Elevation	Mfp SL	Mfp Iso	MDc SL	Od SL	MDc-Od Iso
151-21605	Scott	-84.38486111	36.47433333	11778	1567.6	-582.4	143	-725.4	#VAL-UE!	-11635
151-21606	Scott	-84.38772222	36.47772222	11779	1570.9	-559.1	150	-709.1	#VAL-UE!	-11629
151-21607	Scott	-84.38719444	36.48111111	11780	1554.8	-565.2	120	-685.2	#VAL-UE!	-11660
151-21608	Scott	-84.3955	36.48319444	11781	2271.5	-538.5	130	-668.5	#VAL-UE!	-11651
151-21609	Scott	-84.38927778	36.49605556	11782	1579.1	-530.9	130	-660.9	#VAL-UE!	-11652
151-21610	Scott	-84.39577778	36.4985	11783	1934.7	-525.3	148	-673.3	#VAL-UE!	-11635
151-21611	Scott	-84.38325	36.48277778	11784	1510.4	-563.6	134	-697.6	#VAL-UE!	-11650
151-21612	Scott	-84.38491667	36.491	11785	1546.3	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
151-21613	Scott	-84.38405556	36.48733333	11786	1550.5	-541.5	136	-677.5	#VAL-UE!	-11650
001-20390	Anderson	-84.20552778	36.24052778	11787	1901.4	-1744.6	168	-1912.6	#VAL-UE!	-11619
001-20391	Anderson	-84.20569444	36.23633333	11789	1854.9	-1815.1	76	-1891.1	#VAL-UE!	-11713
001-20392	Anderson	-84.21058333	36.2425	11790	2303.2	-1746.8	106	-1852.8	#VAL-UE!	-11684
151-21614	Scott	-84.59702778	36.31969444	11793	1435	-401	114	-515	#VAL-UE!	-11679
129-21903	Morgan	-84.47975	36.04275	11794	1364.3	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
129-21904	Morgan	-84.48344444	36.04280556	11795	1359.2	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
129-21905	Morgan	-84.46741667	36.03216667	11796	1131.5	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
001-20393	Anderson	-84.24411111	36.11955556	11797	1050.6	-2037.4	121	-2158.4	#VAL-UE!	-11676
001-20394	Anderson	-84.19580556	36.21833333	11800	2170.9	-1827.1	134	-1961.1	#VAL-UE!	-11666
001-20395	Anderson	-84.19819444	36.22258333	11801	1953.4	-1830.6	112	-1942.6	#VAL-UE!	-11689
001-20396	Anderson	-84.18755556	36.23786111	11809	1088.2	-1763.8	70	-1833.8	#VAL-UE!	-11739
001-20397	Anderson	-84.18475	36.23522222	11810	1124.9	-1769.1	74	-1843.1	#VAL-UE!	-11736
001-20398	Anderson	-84.18222222	36.23136111	11811	1074.6	-1775.4	132	-1907.4	#VAL-UE!	-11679
001-20399	Anderson	-84.2115	36.20891667	11813	1929.7	-916.3	164	-1080.3	#VAL-UE!	-11649
129-21906	Morgan	-84.48008333	36.04605556	11817	1358.2	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
001-20400	Anderson	-84.20702778	36.21136111	11820	1897.2	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
151-21615	Scott	-84.47794444	36.21838889	11821	1593.5	-1068.5	102	-1170.5	#VAL-UE!	-11719
151-21616	Scott	-84.29697222	36.56094444	11824	1459.8	-655.2	173	-828.2	#VAL-UE!	-11651
049-21684	Fentress	-85.01052778	36.54102778	11825	980.4	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
001-20401	Anderson	-84.32827778	36.05480556	11826	1135.5	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!

API	County	Longitude	Latitude	Permit	Elevation	Mfp SL	Mfp Iso	MDc SL	Od SL	MDc-Od Iso
129-21907	Morgan	-84.48894444	35.99197222	11827	960.6	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
151-21617	Scott	-84.38358333	36.47838889	11828	1544.7	-563.3	142	-705.3	-1791.3	-11686
129-21908	Morgan	-84.48441667	36.03013889	11829	1203.3	-1590.7	88	-1678.7	#VAL-UE!	-11741
129-21909	Morgan	-84.48583333	36.02702778	11830	1237.9	-1576.1	102	-1678.1	#VAL-UE!	-11728
129-21910	Morgan	-84.36461111	36.05716667	11831	1149.2	-1947.8	127	-2074.8	#VAL-UE!	-11704
001-20402	Anderson	-84.40225	36.12611111	11832	1509.6	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
049-21685	Fentress	-85.01452778	36.54033333	11833	979.7	#VAL-UE!	#VAL-UE!	579.7	#VAL-UE!	#VALUE!
001-20403	Anderson	-84.19841667	36.2135	11835	2272.5	-1852.5	121	-1973.5	#VAL-UE!	-11714
151-21618	Scott	-84.39383333	36.47527778	11839	2245.8	-542.2	154	-696.2	#VAL-UE!	-11685
151-21619	Scott	-84.37905556	36.48280556	11840	1536.8	-576.2	133	-709.2	#VAL-UE!	-11707
151-21620	Scott	-84.37847222	36.47925	11841	1536.1	-571.9	144	-715.9	#VAL-UE!	-11697
151-21621	Scott	-84.37775	36.47402778	11842	1321.3	-598.7	135	-733.7	#VAL-UE!	-11707
129-21911	Morgan	-84.40969444	36.06530556	11843	2232.2	#VAL-UE!	#VAL-UE!	-1785.8	#VAL-UE!	#VALUE!
129-21912	Morgan	-84.40908333	36.06161111	11844	2043.6	-1684.4	138	-1822.4	#VAL-UE!	-11706
151-21622	Scott	-84.37480556	36.47769444	11845	1334.5	-589.5	128	-717.5	#VAL-UE!	-11717
001-20404	Anderson	-84.19436111	36.19644444	11849	1954.7	-1808.3	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
001-20405	Anderson	-84.24652778	36.15547222	11850	2586.6	-1953.4	112	-2065.4	#VAL-UE!	-11738
129-21913	Morgan	-84.40875	36.0905	11851	1654.2	-1603.8	124	-1727.8	#VAL-UE!	-11727
129-21914	Morgan	-84.49758333	36.00727778	11852	985.6	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
129-21915	Morgan	-84.77463889	36.29575	11854	1502.15	76.15	128	-51.85	#VAL-UE!	-11726
151-21623	Scott	-84.37283333	36.47402778	11863	1547.6	-626.4	132	-758.4	#VAL-UE!	-11731
001-20406	Anderson	-84.20933333	36.17383333	11864	1659.4	-1943.6	143	-2086.6	#VAL-UE!	-11721
001-20407	Anderson	-84.22063889	36.17455556	11868	2111.5	-1898.5	144	-2042.5	#VAL-UE!	-11724
001-20408	Anderson	-84.21533333	36.17944444	11869	2132	-1844	76	-1920	#VAL-UE!	-11793
129-21916	Morgan	-84.52661111	36.15577778	11870	1282.4	-1062.6	109	-1171.6	#VAL-UE!	-11761
001-20409	Anderson	-84.20022222	36.17955556	11874	1442.7	-1968.3	117	-2085.3	#VAL-UE!	-11757
001-20410	Anderson	-84.18341667	36.17980556	11875	1440.5	-1970.5	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
001-20411	Anderson	-84.21513889	36.17975	11876	2129.6	-1920.4	116	-2036.4	#VAL-UE!	-11760
001-20412	Anderson	-84.21497222	36.18005556	11877	2125.8	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!

API	County	Longitude	Latitude	Permit	Elevation	Mfp SL	Mfp Iso	MDc SL	Od SL	MDc-Od Iso
001-20413	Anderson	-84.20541667	36.181	11878	1217.8	-1937.2	118	-2055.2	#VAL-UE!	-11760
001-20414	Anderson	-84.20052778	36.17933333	11879	1442.6	-1968.4	117	-2085.4	#VAL-UE!	-11762
129-21917	Morgan	-84.41847222	36.04705556	11880	1157	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
129-21918	Morgan	-84.421	36.07508333	11881	2951.3	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
049-21686	Fentress	-85.07347222	36.45002778	11883	932.7	-1752.3	115	-1867.3	#VAL-UE!	-11768
001-20415	Anderson	-84.39861111	36.14194444	11884	2303.2	-1552.8	103	-1655.8	#VAL-UE!	-11781
129-21919	Morgan	-84.51147222	36.18080556	11885	2186.5	-1006.5	155	-1161.5	#VAL-UE!	-11730
129-21920	Morgan	-84.52638889	36.20136111	11886	1490.5	-899.5	116	-1015.5	#VAL-UE!	-11770
129-21921	Morgan	-84.52547222	36.17138889	11887	1490.5	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
129-21922	Morgan	-84.51772222	36.17688889	11888	1634.8	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
001-20416	Anderson	-84.19775	36.2145	11890	2288.7	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
001-20417	Anderson	-84.19747222	36.21483333	11891	2285.7	-1880.3	54	-1934.3	#VAL-UE!	-11837
129-21923	Morgan	-84.52841667	36.21297222	11899	2190.3	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
001-20418	Anderson	-84.19913889	36.20066667	11900	2016.2	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
129-21924	Morgan	-84.73291667	36.171	11901	1371.2	#VAL-UE!	#VAL-UE!	-284.8	#VAL-UE!	#VALUE!
001-20419	Anderson	-84.20580556	36.23705556	11902	1863.1	-1786.9	96	-1882.9	#VAL-UE!	-11806
001-20420	Anderson	-84.19997222	36.20747222	11903	2305.3	-1839.7	130	-1969.7	#VAL-UE!	-11773
001-20421	Anderson	-84.19911111	36.21011111	11904	2287.3	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
129-21925	Morgan	-84.70136111	36.16488889	11905	1407.4	-268.6	120	-388.6	-1358.6	-11785
151-21624	Scott	-84.37075	36.47888889	11909	1539.9	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
151-21625	Scott	-84.37869444	36.46961111	11910	1790.3	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
151-21626	Scott	-84.37519444	36.48119444	11911	1532.6	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
129-21926	Morgan	-84.59872222	36.25397222	11912	1595.2	-452.8	126	-578.8	-1563.8	-11786
001-20422	Anderson	-84.24413889	36.11947222	11913	1047.7	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
129-21927	Morgan	-84.60388889	36.17111111	11914	1461.8	-632.2	103	-735.2	#VAL-UE!	-11811
001-20423	Anderson	-84.32869444	36.10116667	11915	2435.2	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
129-21928	Morgan	-84.60255556	36.23602778	11917	1555.2	-459.8	124	-583.8	#VAL-UE!	-11793
151-21627	Scott	-84.38222222	36.42847222	11918	1934.7	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
151-21628	Scott	-84.38230556	36.42455556	11919	1651	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!

API	County	Longitude	Latitude	Permit	Elevation	Mfp SL	Mfp Iso	MDc SL	Od SL	MDc-Od Iso
049-21687	Fentress	-85.08341667	36.41763889	11923	865.1	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
001-20424	Anderson	-84.17919444	36.22547222	11924	1099.7	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
049-21688	Fentress	-84.93766667	36.21597222	11925	1707.4	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
151-21629	Scott	-84.35794444	36.4395	11928	1571.8	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
151-21630	Scott	-84.35525	36.44297222	11929	1579.5	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
151-21631	Scott	-84.36111111	36.44458333	11930	1584.4	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
151-21632	Scott	-84.36141667	36.43466667	11931	1527.1	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
151-21633	Scott	-84.36205556	36.43841667	11932	1568.6	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
129-21929	Morgan	-84.63825	36.26508333	11939	1528.4	-365.6	116	-481.6	-1426.6	-11823
049-21689	Fentress	-85.02975	36.55686111	11941	866.3	#VAL-UE!	#VAL-UE!	539.3	-47.7	#VALUE!
049-21690	Fentress	-84.9715	36.37536111	11951	843.7	493.7	145	348.7	-461.3	-11806
129-21930	Morgan	-84.59855556	36.26241667	11952	1524.4	-437.6	122	-559.6	-1501.6	-11830
001-20425	Anderson	-84.35716667	36.06736111	11954	1036.8	-1778.2	115	-1893.2	-3178.2	-11839
049-21691	Fentress	-84.98783333	36.44344444	11962	940	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
151-21634	Scott	-84.33144444	36.50841667	11967	2361.2	-640.8	153	-793.8	#VAL-UE!	-11814
049-21692	Fentress	-85.01913889	36.548	11968	881.2	821.2	195	626.2	18.2	-11773
049-21693	Fentress	-85.04405556	36.46269444	11972	1201.4	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
151-21635	Scott	-84.42947222	36.19422222	11977	1525.1	-1309.9	105	-1414.9	#VAL-UE!	-11872
049-21694	Fentress	-85.07866667	36.41672222	11981	870.9	#VAL-UE!	#VAL-UE!	554.9	-19.1	#VALUE!
129-21931	Morgan	-84.82863889	36.13361111	11982	1578.6	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
049-21695	Fentress	-85.05772222	36.44841667	11987	954.3	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
049-21696	Fentress	-85.01725	36.54705556	11988	838.5	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
151-21636	Scott	-84.34222222	36.48736111	11991	2311.3	-635.7	133	-768.7	#VAL-UE!	-11858
151-21637	Scott	-84.34930556	36.48513889	11996	1884.6	-685.4	140	-825.4	#VAL-UE!	-11856
151-21638	Scott	-84.309	36.51283333	12000	1963.6	-751.4	130	-881.4	#VAL-UE!	-11870
151-21639	Scott	-84.31283333	36.51069444	12001	2145.4	-729.6	130	-859.6	#VAL-UE!	-11871
151-21640	Scott	-84.30936111	36.51272222	12002	1983.3	-731.7	130	-861.7	#VAL-UE!	-11872
151-21641	Scott	-84.31305556	36.5105	12003	2142.7	-702.3	159	-861.3	#VAL-UE!	-11844
129-21932	Morgan	-84.82419444	36.13202778	12007	1543.4	13.4	125	-111.6	#VAL-UE!	-11882
049-21697	Fentress	-84.98325	36.44869444	12009	924.8	674.8	172	502.8	#VAL-UE!	-11837

API	County	Longitude	Latitude	Permit	Elevation	Mfp SL	Mfp Iso	MDc SL	Od SL	MDc-Od Iso
049-21698	Fentress	-85.09022222	36.38758333	12010	978.7	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
049-21699	Fentress	-84.96872222	36.53883333	12011	975.4	770.4	137	633.4	#VAL-UE!	-11874
049-21700	Fentress	-85.01572222	36.53855556	12012	1019.5	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
129-21933	Morgan	-84.62663889	36.21791667	12017	1586	-369	136	-505	#VAL-UE!	-11881
129-21934	Morgan	-84.41716667	36.05833333	12018	1965.3	-1654.7	133	-1787.7	#VAL-UE!	-11885
129-21935	Morgan	-84.51772222	36.17688889	12020	1634.8	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
129-21936	Morgan	-84.61119444	36.17252778	12021	1677.5	-644.5	32	-676.5	#VAL-UE!	-11989
049-21701	Fentress	-85.08452778	36.41755556	12022	882.2	#VAL-UE!	#VAL-UE!	516.2	-58.8	#VALUE!
129-21937	Morgan	-84.83061111	36.13444444	12023	1529.2	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
049-21702	Fentress	-85.01316667	36.54027778	12025	978.6	668.6	145	523.6	#VAL-UE!	-11880
049-21703	Fentress	-85.01419444	36.54144444	12026	975.1	745.1	145	600.1	-49.9	-11881
129-21938	Morgan	-84.417	36.05844444	12030	1959	-1671	122	-1793	#VAL-UE!	-11908
001-20426	Anderson	-84.32869444	36.10116667	12031	2435.2	-1834.8	122	-1956.8	#VAL-UE!	-11909
001-20427	Anderson	-84.32836111	36.20863889	12033	1678.8	-1456.2	131	-1587.2	#VAL-UE!	-11902
151-21642	Scott	-84.42488889	36.20016667	12034	1491	-1323	88	-1411	#VAL-UE!	-11946
129-21939	Morgan	-84.8325	36.13575	12037	1582.9	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
151-21643	Scott	-84.33927778	36.54261111	12038	1127.6	-569.4	157	-726.4	#VAL-UE!	-11881
151-21644	Scott	-84.25277778	36.54097222	12039	2285.6	-820.4	164	-984.4	#VAL-UE!	-11875
049-21704	Fentress	-85.09122222	36.39422222	12042	878.2	731.2	183	548.2	#VAL-UE!	-11859
129-21940	Morgan	-84.77444444	36.13730556	12044	1423.1	-126.9	135	-261.9	#VAL-UE!	-11909
129-21941	Morgan	-84.77319444	36.13505556	12045	1402.7	-132.3	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
001-20428	Anderson	-84.32013889	36.15091667	12046	2286	-1749	125	-1874	#VAL-UE!	-11921
001-20429	Anderson	-84.33827778	36.16008333	12047	1453.1	-1626.9	108	-1734.9	#VAL-UE!	-11939
001-20430	Anderson	-84.25266667	36.14802778	12048	2360.7	-1953.3	108	-2061.3	#VAL-UE!	-11940
151-21645	Scott	-84.25383333	36.5335	12049	2297.7	-947.3	72	-1019.3	#VAL-UE!	-11977
001-20431	Anderson	-84.20316667	36.16044444	12059	1198.5	-2026.5	108	-2134.5	#VAL-UE!	-11951
049-21705	Fentress	-85.09294444	36.45033333	12060	847.8	#VAL-UE!	#VAL-UE!	537.8	-32.2	#VALUE!
129-21942	Morgan	-84.73494444	36.12338889	12071	1387.6	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
129-21943	Morgan	-84.70913889	36.16638889	12080	1441.9	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!

API	County	Longitude	Latitude	Permit	Elevation	Mfp SL	Mfp Iso	MDc SL	Od SL	MDc-Od Iso
049-21562-R1	Fentress	-85.07161111	36.44466667	12084	839	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
129-21944	Morgan	-84.83427778	36.13697222	12096	1561.3	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
049-21706	Fentress	-85.09530556	36.45097222	12102	851.7	#VALUE!	#VALUE!	557.7	-16.3	#VALUE!
129-21945	Morgan	-84.75083333	36.11	12116	1359.2	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
129-21946	Morgan	-84.84280556	36.13286111	12117	1609.4	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
151-21646	Scott	-84.59575	36.29630556	12126	1839.8	-480.2	114	-594.2	#VALUE!	-12012
129-21947	Morgan	-84.60191667	36.15861111	12127	1418.2	-691.8	#VALUE!	#VALUE!	#VALUE!	#VALUE!
129-21948	Morgan	-84.60208333	36.1585	12128	1418.2	-693.8	114	-807.8	#VALUE!	-12014
129-21949	Morgan	-84.60172222	36.15869444	12129	1416.1	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
001-20432	Anderson	-84.26205556	36.13244444	12136	1952.4	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
001-20433	Anderson	-84.26225	36.13233333	12137	1943.9	-2026.1	108	-2134.1	#VALUE!	-12029
151-21647	Scott	-84.47758333	36.28411111	12144	2223.6	-855.4	115	-970.4	#VALUE!	-12029
151-21648	Scott	-84.47775	36.284	12145	2223.9	-848.1	118	-966.1	#VALUE!	-12027
151-21649	Scott	-84.59541667	36.29888889	12146	1865.02	-474.98	110	-584.98	#VALUE!	-12036
049-21707	Fentress	-85.03394444	36.53813889	12155	929.9	#VALUE!	#VALUE!	602.9	-7.1	#VALUE!
151-21650	Scott	-84.3835	36.39416667	12156	2061	-808	91	-899	#VALUE!	-12065
151-21651	Scott	-84.47758333	36.27627778	12157	2273.9	-864.1	118	-982.1	#VALUE!	-12039
049-21708	Fentress	-85.01088889	36.53902778	12164	972.9	#VALUE!	#VALUE!	607.9	-29.1	#VALUE!
151-21652	Scott	-84.42086111	36.20283333	12165	1481.7	-1358.3	124	-1482.3	#VALUE!	-12041
129-21950	Morgan	-84.61672222	36.21711111	12168	1623	-430	117	-547	#VALUE!	-12051
129-21951	Morgan	-84.40922222	36.05833333	12169	1835.6	-1706.4	112	-1818.4	#VALUE!	-12057
151-21653	Scott	-84.59661111	36.30097222	12170	1874.4	-494.6	77	-571.6	#VALUE!	-12093
049-21709	Fentress	-85.01172222	36.53766667	12171	959.8	#VALUE!	#VALUE!	585.8	-42.2	#VALUE!
001-20434	Anderson	-84.41680556	36.13033333	12179	1944.9	-1521.1	110	-1631.1	#VALUE!	-12069
001-20435	Anderson	-84.41661111	36.13044444	12180	1938.7	-1541.3	114	-1655.3	#VALUE!	-12066
049-21710	Fentress	-85.07013889	36.44477778	12188	861.7	761.7	155	606.7	#VALUE!	-12033
001-20436	Anderson	-84.33736111	36.21047222	12190	2071.1	-1464.9	120	-1584.9	#VALUE!	-12070
001-20437	Anderson	-84.33755556	36.21036111	12191	2070.2	-1460.8	119	-1579.8	#VALUE!	-12072
129-21952	Morgan	-84.60416667	36.16125	12192	1433.6	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!

API	County	Longitude	Latitude	Permit	Elevation	Mfp SL	Mfp Iso	MDc SL	Od SL	MDc-Od Iso
129-21953	Morgan	-84.60197222	36.16988889	12193	1431.4	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
129-21954	Morgan	-84.59527778	36.15644444	12194	1395.2	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
129-21955	Morgan	-84.60505556	36.16894444	12195	1470.4	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
049-21711	Fentress	-84.83283333	36.37369444	12199	1573	343	101	242	#VAL-UE!	-12098
049-21712	Fentress	-84.84027778	36.37772222	12200	1579.8	287.8	30	257.8	-608.2	-12170
049-21713	Fentress	-85.01258333	36.53691667	12202	932.8	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
049-21714	Fentress	-85.03530556	36.53833333	12209	910.3	#VAL-UE!	#VAL-UE!	597.3	10.3	#VALUE!
001-20438	Anderson	-84.21916667	36.19505556	12213	2278.8	#VAL-UE!	#VAL-UE!	-1973.2	#VAL-UE!	#VALUE!
001-20439	Anderson	-84.17916667	36.22544444	12219	1099.2	-1840.8	116	-1956.8	#VAL-UE!	-12103
129-21956	Morgan	-84.74763889	36.11008333	12224	1400.3	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
001-20440	Anderson	-84.20052778	36.22894444	12228	1088.6	-1951.4	138	-2089.4	#VAL-UE!	-12090
049-21715	Fentress	-84.9415	36.57763889	12231	938.3	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
001-20441	Anderson	-84.35291667	36.07288889	12259	1023.8	-1752.2	108	-1860.2	-3187.2	-12151
129-21957	Morgan	-84.83055556	36.13188889	12271	1560.2	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
049-21716	Fentress	-85.01994444	36.54875	12275	880.2	#VAL-UE!	#VAL-UE!	620.2	38.2	#VALUE!
151-21654	Scott	-84.46844444	36.29166667	12285	2229.4	-864.6	88	-952.6	#VAL-UE!	-12197
151-21655	Scott	-84.47980556	36.30347222	12286	1966.7	-760.3	121	-881.3	#VAL-UE!	-12165
151-21656	Scott	-84.46863889	36.29158333	12287	2224.8	-860.2	95	-955.2	#VAL-UE!	-12192
129-21958	Morgan	-84.77547222	36.13452778	12296	1401.9	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
129-21959	Morgan	-84.83877778	36.13288889	12297	1590.6	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
129-21960	Morgan	-84.61027778	36.21666667	12299	1724.1	-418.9	140	-558.9	#VAL-UE!	-12159
129-21961	Morgan	-84.60386111	36.16688889	12307	1441.6	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
129-21962	Morgan	-84.59958333	36.15669444	12308	1391.1	-690.9	122	-812.9	#VAL-UE!	-12186
001-20442	Anderson	-84.34919444	36.19461111	12309	2264	-1463	113	-1576	#VAL-UE!	-12196
001-20443	Anderson	-84.349	36.19472222	12310	2264.3	-1480.7	113	-1593.7	#VAL-UE!	-12197
049-21557-R1	Fentress	-85.05308333	36.45838889	12313	926	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
049-21717	Fentress	-84.95066667	36.17708333	12315	1726.27	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
129-21963	Morgan	-84.83066667	36.13947222	12324	1535.7	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VAL-UE!	#VALUE!
001-20444	Anderson	-84.3605	36.18144444	12326	2273.3	-1506.7	111	-1617.7	#VAL-UE!	-12215
049-21718	Fentress	-85.014	36.52894444	12332	1185.3	705.3	140	565.3	-74.7	-12192

API	County	Longitude	Latitude	Permit	Elevation	Mfp SL	Mfp Iso	MDc SL	Od SL	MDc-Od Iso
001-20445	Anderson	-84.33780556	36.14283333	12334	2251.4	-1715.6	116	-1831.6	#VALUE!	-12218
001-20446	Anderson	-84.33502778	36.15783333	12335	1547	-1603	156	-1759	#VALUE!	-12179
151-21657	Scott	-84.41275	36.20088889	12336	1549.4	-1283.6	157	-1440.6	#VALUE!	-12179
151-21658	Scott	-84.41630556	36.20358333	12337	1518.8	-1271.2	146	-1417.2	#VALUE!	-12191
049-21719	Fentress	-85.07147222	36.44266667	12349	908.7	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
035-20186-R1	Cumberland	-85.22688889	35.833	12352	1676	462	162	300	#VALUE!	-12190
049-21720	Fentress	-85.08388889	36.42316667	12355	919.4	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
049-21721	Fentress	-85.09463889	36.39263889	12370	937.7	667.7	135	532.7	-74.3	-12235
151-21659	Scott	-84.64027778	36.35013889	12404	1326	-182	#VALUE!	#VALUE!	#VALUE!	#VALUE!
049-21722	Fentress	-85.04875	36.45752778	12427	779.8	744.8	118	626.8	-40.2	-12309
129-21964	Morgan	-84.60769444	36.17033333	12432	1616.8	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
129-21965	Morgan	-84.60016667	36.167	12433	1426.3	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
129-21966	Morgan	-84.59288889	36.15819444	12434	1384.4	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
129-21967	Morgan	-84.60605556	36.16513889	12435	1470.9	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
151-21660	Scott	-84.37761111	36.39477778	12440	2002.88	-801.12	126	-927.12	#VALUE!	-12314
151-21661	Scott	-84.58211111	36.38641667	12445	1370.4	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
049-21723	Fentress	-84.8485	36.40233333	12452	1550.8	354.8	106	248.8	#VALUE!	-12346
129-21968	Morgan	-84.59308333	36.15238889	12453	1339.1	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
129-21969	Morgan	-84.60852778	36.22044444	12454	1765.7	-442.3	35	-477.3	#VALUE!	-12419
001-20447	Anderson	-84.33236111	36.20844444	12458	1914.1	-1457.9	124	-1581.9	#VALUE!	-12334
001-20448	Anderson	-84.37272222	36.17402778	12459	2267.1	-1503.9	116	-1619.9	#VALUE!	-12343
001-20449	Anderson	-84.37252778	36.17411111	12460	2262.9	-1517.1	110	-1627.1	#VALUE!	-12350

Field Data for Lancing, Hebberstburg, and Fox Creek quadrangles.

[Does not include structural data from Rascoe (1951), Stearns (1954), and Moore (unpublished).

QUAD	STATION	UTM Northing	UTM Easting	STRIKE	INCLINE	TYPE	LITHOLOGY 1	GRAIN SIZE	LITHOLOGY 2	GRAIN SIZE 2	MODIFIER
Lancing	1	3988945	706022	260	23	bedding inclined	Sandstone	Fine	Shale		
Lancing	2	3986684	705317	0	0	float	Conglomerate	Med-Coarse			
Lancing	3	3992508	704493	57	30	bedding inclined	Sandstone	Med-Fine			
Lancing	4	3992854	704964	110	27	bedding inclined	Sandstone	Med-Fine			
Lancing	5	3992887	705032	56	14	bedding inclined	Sandstone	Med-Fine			
Lancing	6	3993212	705411	84	23	bedding inclined	Sandstone	Med-Fine			
Lancing	7	3993289	705500	72	17	bedding inclined	Sandstone	Med-Fine			
Lancing	8	3993387	705727	77	28	bedding inclined	Sandstone				
Lancing	9	3993342	705909	47	23	bedding inclined	Shale	Fine	Sandstone	Fine	
Lancing	10	3993453	706121	53	16	bedding inclined	Shale	Shale	Sandstone	Fine	
Lancing	11	3993278	706228	57	14	bedding inclined					
Lancing	12	3993271	706234	220	16	bedding inclined					
Lancing	13	3993259	706254	43	16	bedding inclined					
Lancing	14	3993255	706258	241	12	bedding inclined					
Lancing	15	3993243	706270	340	28	bedding inclined	Breccia				Brecciated
Lancing	16	3993237	706283	210	6	bedding inclined					
Lancing	17	3993142	706521	23	23	bedding inclined	Sandstone				
Lancing	18	3992914	706745	49	11	bedding inclined	Shale				
Lancing	19	3992749	706912	34	3	bedding inclined	Shale				
Lancing	20	3993982	710287	57	47	bedding inclined	Sandstone		Shale		
Lancing	21	3991817	703065	55	50	bedding inclined	Shale	Fine			
Lancing	22	3991792	703113	54	52	bedding inclined	Sandstone				
Lancing	23	3992203	703699	0	0	float	Sandstone				
Lancing	24	3992615	704032	0	0	outcrop	Conglomerate				
Lancing	25	3992627	704305	10	36	bedding inclined	Sandstone				
Lancing	26	3992537	704088	41	73	bedding inclined	Sandstone	Med-Fine			
Lancing	27	3992433	704019	50	66	bedding inclined	Sandstone				
Lancing	28	3992490	704148	54	72	bedding inclined	Sandstone				
Lancing	29	3992528	704202	55	79	bedding inclined	Sandstone				
Lancing	30	3992670	704237	0	0	float	Siltstone				
Lancing	31	3992670	704240	121	54	bedding inclined	Siltstone				
Lancing	32	3992653	704144	0	0	outcrop	Siltstone		Siltstone		
Lancing	33	3992667	704104	62	68	bedding inclined	Siltstone				
Lancing	34	3992781	704066	0	0	float	Breccia				Brecciated
Lancing	35	3990475	706769	0	0	outcrop	Shale				
Lancing	36	3989887	707097	0	0	float	Sandstone	Med-Fine			

QUAD	STATION	UTM Northing	UTM Easting	STRIKE	INCLINE	TYPE	LITHOLOGY 1	GRAIN SIZE	LITHOLOGY 2	GRAIN SIZE 2	MODIFIER
Lancing	37	3989803	706959	0	0	outcrop	Sandstone	Med-Fine			
Lancing	38	3989770	706918	216	23	bedding inclined	Sandstone				
Lancing	39	3989741	706922	180	26	bedding inclined	Sandstone				
Lancing	40	3989727	706959	0	0	outcrop	Sandstone		Shale	Fine	
Lancing	41	3989723	706979	229	5	bedding inclined	Shale				
Lancing	42	3989741	706986	228	14	bedding inclined	Sandstone				
Lancing	43	3989745	707025	206	11	bedding inclined	Sandstone				
Lancing	44	3989638	707211	230	7	bedding inclined	Sandstone		Shale		
Lancing	45	3989580	707244	236	7	bedding inclined	Shale				
Lancing	46	3989409	707255	236	7	bedding inclined	Shale				
Lancing	47	3989369	707261	233	6	bedding inclined	Shale				
Lancing	48	3989256	707381	240	9	bedding inclined	Shale		Sandstone		
Lancing	49	3989182	707371	0	0	outcrop	Shale		Sandstone		
Lancing	50	3989030	707554	225	18	bedding inclined	Sandstone				
Lancing	51	3989560	708918	135	13	bedding inclined	Sandstone				
Lancing	52	3989500	709374	0	0	bedding horizontal	Sandstone				
Lancing	53	3989485	709391	191	3	bedding inclined	Sandstone				
Lancing	54	3989666	709767	0	0		Shale				
Lancing	55	3989796	709760	255	27	bedding inclined	Sandstone				
Lancing	56	3990145	710172	0	0						
Lancing	57	3992822	703779	0	0	outcrop	Sandstone	Med-Coarse			
Lancing	58	3992775	703855	316	50	bedding inclined	Sandstone	Med-Coarse			
Lancing	59	3992773	704017	270	51	bedding inclined	Sandstone	Med-Coarse			
Lancing	60	3992625	704168	158	31	bedding inclined	Sandstone	Med-Coarse			
Lancing	61	3992726	704128	0	0	float	Siltstone				
Lancing	62	3992862	704883	83	21	bedding inclined	Sandstone				
Lancing	63	3992994	704812	79	17	bedding inclined	Sandstone	Med-Fine			
Lancing	64	3993039	704862	77	16	bedding inclined	Sandstone				
Lancing	65	3993061	704887	85	16	bedding inclined	Sandstone				
Lancing	66	3993289	704965	0	0	float	Breccia				Brecciated
Lancing	67	3993165	704848	0	0	float	Breccia				Brecciated
Lancing	68	3992920	704625	57	16	bedding inclined	Sandstone	Fine			
Lancing	69	3992835	704683	57	14	bedding inclined	Sandstone	Fine			
Lancing	70	3992785	704710	0	0	float	Sandstone				

QUAD	STATION	UTM Northing	UTM Easting	STRIKE	INCLINE	TYPE	LITHOLOGY 1	GRAIN SIZE	LITHOLOGY 2	GRAIN SIZE 2	MODIFIER
Lancing	71	3993600	706018	48	14	bedding inclined	Sandstone	Fine			
Lancing	72	3993822	706185	0	0	outcrop	Sandstone	Fine			
Lancing	73	3993831	706179	26	19	bedding inclined	Sandstone	Med-Fine			
Lancing	74	3993840	706161	39	30	bedding inclined	Sandstone	Med-Fine			
Lancing	75	3993849	706150	44	21	bedding inclined	Sandstone	Med-Fine			
Lancing	76	3993865	706140	256	54	bedding inclined	Shale	Med-Fine			
Lancing	77	3993864	706137	41	25	bedding inclined	Sandstone	Med-Fine			
Lancing	78	3993877	706061	51	23	bedding inclined	Sandstone	Medium			
Lancing	79	3993871	706020	0	0	outcrop	Sandstone	Med-Coarse			
Lancing	80	3993888	705945	0	0	float					
Lancing	81	3993899	705904	79	22	bedding inclined	Sandstone	Medium	Shale		
Lancing	82	3993918	705895	60	61	bedding inclined	Shale				
Lancing	82	3993918	705895	235	39	bedding inclined	Shale				
Lancing	83	3993935	705881	0	0	outcrop	Sandstone	Med-Fine			
Lancing	84	3993955	705875	40	32	bedding inclined	Sandstone	Med-Fine			
Lancing	85	3993972	705885	24	20		Sandstone	Med-Fine			
Lancing	86	3994445	706512	0	0	outcrop	Sandstone	Coarse			
Lancing	87	3994512	706592	0	0	outcrop	Sandstone	Med-Coarse			
Lancing	88	3994573	706700	62	28	bedding inclined	Sandstone	Med-Coarse			
Lancing	89	3994743	707012	0	0	outcrop	Sandstone	Med-Fine			
Lancing	90	3994740	706942	0	0	outcrop	Sandstone	Med-Coarse			
Lancing	91	3994680	706919	316	20	bedding inclined	Sandstone	Med-Coarse			
Lancing	92	3995023	707057	0	0	outcrop	Sandstone	Med-Fine			
Lancing	93	3995119	707220	0	0	outcrop	Sandstone	Med-Coarse			
Lancing	94	3995176	707252	48	34	bedding inclined	Sandstone	Medium			
Lancing	95	3995142	707257	52	30	bedding inclined	Shale				
Lancing	96	3995222	707342	40	35	bedding inclined	Shale				
Lancing	97	3995237	707378	0	0	float	Sandstone	Med-Coarse			
Lancing	98	3995218	707376	41	23	bedding inclined	Sandstone	Med-Coarse			
Lancing	99	3995549	707868	95	22	bedding inclined	Sandstone	Med-Fine			
Lancing	100	3995679	707797	126	32	bedding inclined	Sandstone	Med-Coarse			
Lancing	101	3996031	707342	124	2	bedding inclined	Sandstone	Med-Coarse			
Lancing	102	3994195	710363	118	24	bedding inclined	Sandstone	Med-Coarse			Brecciated
Lancing	103	3994212	710363	99	46	bedding inclined	Sandstone	Med-Coarse			Brecciated
Lancing	104	3994228	710364	251	28	fold hinge	Sandstone	Med-Coarse			Brecciated
Lancing	105	3994236	710364	256	49	bedding inclined	Sandstone	Med-Coarse			Brecciated
Lancing	106	3994249	710386	81	3	bedding inclined	Sandstone	Medium			
Lancing	107	3994251	710359	260	27	fold hinge	Sandstone	Med-Coarse			Brecciated

QUAD	STATION	UTM Northing	UTM Easting	STRIKE	INCLINE	TYPE	LITHOLOGY 1	GRAIN SIZE	LITHOLOGY 2	GRAIN SIZE 2	MODIFIER
Lancing	107	3994251	710359	75	61	bedding inclined	Sandstone	Med-Coarse			Brecciated
Lancing	108	3994255	710355	275	30	fold hinge	Sandstone	Med-Coarse			Brecciated
Lancing	108	3994255	710355	100	49	bedding inclined	Sandstone	Med-Coarse			Brecciated
Lancing	109	3994266	710350	274	29	fold hinge					
Lancing	109	3994266	710350	166	52	bedding inclined					
Lancing	109	3994266	710350	155	49	bedding inclined					
Lancing	110	3994296	710366	1	3	bedding inclined	Sandstone	Med-Coarse			
Lancing	111	3994304	710356	340	6	bedding inclined	Sandstone	Medium			
Lancing	112	3994367	710334	270	2	bedding inclined	Sandstone	Medium			X-Bedded
Lancing	113	3994378	710358	0	0	float	Sandstone	Med-Fine			
Lancing	114	3994396	710393	349	16	bedding inclined	Sandstone	Med-Fine			
Lancing	115	3994538	710353	279	8	bedding inclined					
Lancing	116	3994539	710352	14	13	bedding inclined	Shale				
Lancing	117	3994316	710212	0	0	outcrop	Sandstone	Med-Fine			Brecciated
Lancing	118	3994179	710373	0	0	float					
Lancing	119	3994131	710404	89	36	bedding inclined	Shale				
Lancing	120	3992073	702712	0	0						
Lancing	121	3992066	702709	76	29	bedding inclined	Sandstone	Medium			
Lancing	122	3992269	702954	0	0	outcrop	Conglomerate	Coarse			
Lancing	123	3992272	702971	106	90	bedding vertical	Shale				
Lancing	124	3992294	702997	119	16	bedding inclined	Shale				
Lancing	124	3992294	702997	59	90	bedding vertical	Shale				
Lancing	125	3992922	703720	0	0	outcrop	Sandstone	Med-Fine			
Lancing	126	3992923	703751	0	0	outcrop	Conglomerate	Med-Coarse			
Lancing	127	3993158	703633	139	11	bedding inclined	Sandstone	Med-Fine			
Lancing	128	3993112	703399	0	0	float	Conglomerate	Med-Coarse			
Lancing	129	3993075	703363	0	0	float	Sandstone	Med-Coarse			
Lancing	130	3993084	703274	235	24	bedding inclined	Sandstone	Med-Coarse			
Lancing	131	3993017	703218	225	26	bedding inclined	Sandstone	Med-Coarse			
Lancing	132	3992971	703122	0	0	outcrop	Sandstone	Med-Coarse			
Lancing	133	3992912	702952	41	18	bedding inclined	Sandstone	Med-Coarse			
Lancing	134	3992894	702912	62	7	bedding inclined	Sandstone	Med-Fine			Brecciated
Lancing	135	3992817	702930	0	0	outcrop	Sandstone	Med-Coarse			
Lancing	136	3992620	703081	0	0		Sandstone	Med-Coarse			
Lancing	137	3988625	707647	176	6	bedding inclined	Sandstone	Med-Coarse	Shale		
Lancing	137	3988625	707647	331	12	bedding inclined	Sandstone	Med-Coarse	Shale		
Lancing	138	3988430	707573	0	0		Sandstone	Fine			
Lancing	139	3988030	707966	341	7	bedding inclined	Sandstone	Fine			

QUAD	STATION	UTM Northing	UTM Easting	STRIKE	INCLINE	TYPE	LITHOLOGY 1	GRAIN SIZE	LITHOLOGY 2	GRAIN SIZE 2	MODIFIER
Lancing	140	3987979	707949	315	7	bedding inclined	Sandstone	Fine			
Lancing	141	3987906	707817	324	4	bedding inclined	Sandstone	Fine			
Lancing	142	3987847	707718	305	8	bedding inclined	Sandstone	Med-Fine			
Lancing	143	3987912	707707	332	11	bedding inclined	Sandstone	Fine			
Lancing	144	3986967	707702	24	14	bedding inclined	Sandstone	Med-Coarse			
Lancing	145	3987014	707707	0	0	float	Sandstone	Med-Coarse			
Lancing	146	3986989	707658	0	0	outcrop	Sandstone	Med-Coarse			
Lancing	147	3986520	708303	0	0	bedding horizontal	Sandstone				
Lancing	148	3986556	708575	299	9	bedding inclined	Sandstone	Med-Coarse			
Lancing	149	3986324	708622	56	16	bedding inclined	Shale				
Lancing	150	3986339	708666	330	14	bedding inclined	Shale				
Lancing	151	3986354	708661	35	19	bedding inclined	Shale				
Lancing	152	3986524	708628	212	15	fold hinge	Shale				
Lancing	153	3986531	708644	304	16	bedding inclined	Sandstone	Med-Coarse			
Lancing	154	3987075	706901	60	2	bedding inclined	Sandstone	Med-Fine			
Lancing	155	3986764	705746	216	6	bedding inclined	Sandstone	Fine			
Lancing	156	3986677	705564	0	0	float	Conglomerate				
Lancing	157	3986692	705449	20	28	bedding inclined	Conglomerate				
Lancing	158	3986631	705339	19	28	bedding inclined	Conglomerate				
Lancing	159	3987007	705434	0	0	outcrop	Conglomerate	Coarse			
Lancing	160	3987165	705485	46	39	bedding inclined	Conglomerate	Coarse			
Lancing	160	3987165	705485	306	0	joint inclined	Conglomerate	Coarse			
Lancing	161	3987181	705559	350	74	bedding inclined	Conglomerate				
Lancing	162	3987247	705445	0	0	outcrop	Sandstone	Med-Fine			
Lancing	163	3987362	705486	34	43	bedding inclined	Sandstone	Med-Fine			
Lancing	164	3987757	705311	170	14	bedding inclined	Sandstone	Med-Fine			
Lancing	165	3997024	713499	11	2	bedding inclined	Sandstone	Med-Coarse			
Lancing	166	3996991	713555	0	0	bedding horizontal	Sandstone	Med-Fine			
Lancing	167	3997068	713675	0	0	outcrop	Sandstone	Medium	Shale		
Lancing	168	3997082	713675	0	0	outcrop	Shale		Sandstone	Fine	
Lancing	169	3997109	713695	254	11	bedding inclined	Sandstone	Med-Fine			
Lancing	170	3997274	713760	235	3	bedding inclined	Sandstone	Med-Fine			
Lancing	171	3997474	713728	0	0	outcrop	Sandstone	Med-Fine			
Lancing	172	3997790	713639	150	1	bedding inclined	Sandstone	Med-Fine			
Lancing	173	3994011	711874	0	0	outcrop	Shale				
Lancing	174	3994208	711848	0	0	bedding horizontal	Sandstone	Med-Fine			

QUAD	STATION	UTM Northing	UTM Easting	STRIKE	INCLINE	TYPE	LITHOLOGY 1	GRAIN SIZE	LITHOLOGY 2	GRAIN SIZE 2	MODIFIER
Lancing	175	3994248	711914	349	1	bedding inclined	Sandstone	Med-Fine			
Lancing	176	3994230	711894	0	0	bedding horizontal	Sandstone	Med-Fine			
Lancing	177	3989130	708913	195	2	bedding inclined	Sandstone	Fine			
Lancing	178	3989137	708941	335	7	bedding inclined	Sandstone	Fine			X-Bedded
Lancing	179	3989126	708938	46	14	bedding inclined	Sandstone	Fine			
Lancing	180	3989061	708929	289	5	bedding inclined	Sandstone	Med-Fine			
Lancing	181	3989046	708903	315	8	bedding inclined	Sandstone	Med-Coarse			
Lancing	182	3989031	708892	0	0	float					
Lancing	183	3989099	708828	298	12	bedding inclined	Sandstone	Med-Coarse			X-Bedded
Lancing	184	3989175	708752	0	0	float	Sandstone	Coarse			
Lancing	185	3989239	708739	23	24	bedding inclined	Sandstone	Fine			
Lancing	186	3989256	708739	301	7	bedding inclined	Sandstone	Fine			
Lancing	187	3989393	708789	224	3	bedding inclined	Sandstone	Med-Coarse			
Lancing	188	3989410	708842	234	2	bedding inclined	Sandstone	Med-Coarse			
Lancing	189	3993666	704847	0	0	float	Sandstone	Med-Coarse			
Lancing	190	3993864	704728	0	0	float	Sandstone	Med-Coarse			
Lancing	191	3993968	704680	0	0	bedding horizontal	Sandstone	Med-Coarse			Brecciated
Lancing	192	3994078	704666	0	0	float	Sandstone	Med-Fine			
Lancing	193	3994478	704404	0	0	bedding horizontal	Sandstone	Med-Coarse			
Lancing	194	3994244	704274	58	8	bedding inclined	Sandstone	Med-Coarse			
Lancing	195	3994518	704805	0	0	float	Sandstone	Med-Fine	Other		
Lancing	196	3994177	705628	0	0	float	Sandstone	Med-Fine			
Lancing	197	3994289	704027	24	4	bedding inclined	Conglomerate				
Lancing	198	3994077	710874	116	8	bedding inclined	Conglomerate				
Lancing	199	3994087	710929	102	8	bedding inclined	Conglomerate				
Lancing	200	3994071	711267	31	5	bedding inclined	Sandstone				
Lancing	201	3994048	711315	121	2	bedding inclined	Shale				
Lancing	202	3994091	711068	148	3	bedding inclined	Sandstone				
Lancing	203	3993950	710906	116	5	bedding inclined	Shale				
Lancing	204	3993818	710794	0	0	float	Conglomerate				
Lancing	205	3993768	710898	68	12	bedding inclined	Sandstone				
Lancing	206	3993722	710945	0	0	float	Sandstone				
Lancing	207	3988451	707508	209	4	bedding inclined	Sandstone				
Lancing	208	3988472	707527	0	0	float	Sandstone				
Lancing	209	3988460	707435	205	3	bedding inclined	Sandstone				
Lancing	210	3988426	707189	29	4	bedding inclined	Sandstone				
Lancing	211	3988440	707140	306	4		Sandstone		Shale		

QUAD	STATION	UTM Northing	UTM Easting	STRIKE	INCLINE	TYPE	LITHOLOGY 1	GRAIN SIZE	LITHOLOGY 2	GRAIN SIZE 2	MODIFIER
Lancing	212	3988467	706969	308	6	bedding inclined	Sandstone				
Lancing	212	3988467	706969	58	19	other	Sandstone				
Lancing	213	3988488	706702	0	0	float	Sandstone				
Lancing	214	3988627	706682	236	14	bedding inclined	Sandstone				
Lancing	215	3989539	706900	278	6	bedding inclined	Sandstone				
Lancing	216	3989075	706154	261	9	bedding inclined	Sandstone				
Lancing	217	3988898	706068	0	0	float	Sandstone				
Lancing	218	3988836	706110	0	0	float	Sandstone				
Lancing	219	3988825	706091	246	16	bedding inclined	Sandstone				
Lancing	220	3988823	706077	229	9	bedding inclined	Sandstone				
Lancing	221	3988825	706058	236	13	bedding inclined	Sandstone				
Lancing	222	3988802	705978	225	14	bedding inclined	Sandstone				
Lancing	223	3988784	705884	248	16	bedding inclined	Sandstone				
Lancing	224	3988524	705749	234	16	bedding inclined	Sandstone				
Lancing	225	3988490	705605	230	17	bedding inclined	Sandstone				
Lancing	226	3988122	705454	238	13	bedding inclined	Sandstone				
Lancing	227	3992664	713484	230	11	bedding inclined	Conglomerate				
Lancing	228	3992771	713350	245	4	bedding inclined	Conglomerate				
Lancing	229	3992925	713142	252	3	bedding inclined	Sandstone				
Lancing	230	3992966	713081	0	0	bedding horizontal	Conglomerate				
Lancing	231	3993006	712922	0	0	float	Conglomerate				
Lancing	232	3993016	712860	0	0	bedding horizontal	Conglomerate				
Lancing	232	3993016	712860	2	0	joint inclined	Conglomerate				
Lancing	233	3993055	712718	0	0	float	Shale				
Lancing	234	3993072	712641	18	5	bedding inclined	Conglomerate				
Lancing	235	3993118	712445	0	0	float	Conglomerate				
Lancing	236	3993132	712386	0	0	outcrop	Conglomerate				
Lancing	237	3993162	712249	54	13	bedding inclined	Conglomerate				
Lancing	238	3993265	711995	56	7	bedding inclined	Conglomerate				
Lancing	239	3993299	711937	86	15	bedding inclined	Sandstone				
Lancing	240	3993436	711774	0	0	bedding horizontal	Sandstone				
Lancing	241	3993545	711674	0	0	float	Conglomerate		Shale		
Lancing	242	3993629	711584	0	0	float					
Lancing	243	3993741	711410	57	5	bedding inclined	Shale				
Lancing	244	3993735	711394	119	20	bedding inclined	Conglomerate		Shale		
Lancing	245	3993723	711099	0	0	float	Sandstone		Shale		
Lancing	246	3994188	710871	0	0	float	Conglomerate				

QUAD	STATION	UTM Northing	UTM Easting	STRIKE	INCLINE	TYPE	LITHOLOGY 1	GRAIN SIZE	LITHOLOGY 2	GRAIN SIZE 2	MODIFIER
Lancing	247	3994310	710902	0	0	bedding horizontal	Conglomerate	Med-Fine			
Lancing	248	3994288	710938	244	4	bedding inclined	Conglomerate				
Lancing	249	3994681	711361	0	0	float	Sandstone	Fine			
Lancing	250	3994411	711132	258	3	bedding inclined	Conglomerate				
Lancing	251	3993990	710578	0	0	float	Sed Breccia	Med-Coarse			
Lancing	252	3994145	710779	0	0	outcrop	Shale	Med-Fine			
Lancing	253	3993766	710527	288	17	bedding inclined	Sandstone	Med-Fine			
Lancing	254	3991998	709743	39	1	bedding inclined	Sandstone	Med-Coarse			
Lancing	255	3991941	710242	255	11		Sandstone	Med-Fine			
Lancing	256	3991910	710256	249	17	bedding inclined	Sandstone	Med-Coarse			
Lancing	257	3991910	710581	17	2	bedding inclined	Sandstone	Med-Fine			
Lancing	258	3991142	710643	0	0	outcrop	Sandstone	Med-Fine			
Lancing	259	3990926	710776	79	5	bedding inclined	Sandstone	Med-Fine			
Lancing	260	3990467	710645	119	1		Sandstone	Med-Fine			
Lancing	261	3989859	709781	0	0	outcrop	Sandstone	Med-Coarse			
Lancing	262	3988126	708776	0	0	float	Sandstone	Med-Coarse			
Lancing	263	3987896	708909	324	8	bedding inclined	Shale				
Lancing	264	3987877	708950	336	6	bedding inclined	Shale				
Lancing	265	3987858	708983	344	54	bedding inclined	Shale				
Lancing	266	3987872	708983	0	0	bedding horizontal	Sandstone	Med-Coarse			
Lancing	267	3987887	709734	116	6	bedding inclined	Sandstone	Med-Coarse			
Lancing	268	3987851	710168	132	5	bedding inclined	Sandstone	Med-Coarse			
Lancing	269	3988120	706146	0	0	float	Conglomerate	Med-Coarse			
Lancing	270	3988069	706176	0	0	float	Conglomerate				
Lancing	271	3988074	706204	221	34	bedding inclined	Conglomerate				
Lancing	272	3988030	706220	37	17	bedding inclined	Conglomerate	Med-Coarse			
Lancing	273	3987980	705947	0	0	float	Sandstone	Med-Coarse			
Lancing	274	3987383	703923	233	12	bedding inclined	Conglomerate				
Lancing	275	3987507	703997	255	11	bedding inclined	Conglomerate				
Lancing	276	3987674	704079	227	28	bedding inclined	Conglomerate				
Lancing	277	3987337	704331	226	24	bedding inclined	Sandstone	Med-Coarse			
Lancing	278	3988182	704987	220	11	bedding inclined	Conglomerate				
Lancing	279	3988068	704963	239	15	bedding inclined					
Lancing	280	3992369	713272	94	4	bedding inclined	Sandstone	Med-Coarse			
Lancing	281	3992405	713290	105	26	bedding inclined	Sandstone	Med-Coarse			
Lancing	282	3992457	713215	115	34	bedding inclined	Sandstone	Med-Coarse			
Lancing	283	3991187	713159	189	7	bedding inclined	Sandstone	Fine			

QUAD	STATION	UTM Northing	UTM Easting	STRIKE	INCLINE	TYPE	LITHOLOGY 1	GRAIN SIZE	LITHOLOGY 2	GRAIN SIZE 2	MODIFIER
Lancing	284	3991131	713248	254	5	bedding inclined	Sandstone	Fine			
Lancing	285	3993657	710971	0	0	outcrop	Shale				
Lancing	286	3993765	710714	0	0						
Lancing	287	3993765	710702	96	79	bedding inclined	Shale				
Lancing	287	3993765	710702	284	77	bedding inclined	Shale				
Lancing	287	3993765	710702	111	3	fold hinge	Shale				
Lancing	288	3993821	710725	0	0	outcrop	Sandstone	Med-Fine			
Lancing	289	3993883	710476	108	41	bedding inclined	Shale				
Lancing	290	3993869	710475	0	0		Sandstone	Med-Coarse			
Lancing	291	3993859	710486	0	0	outcrop	Sandstone	Med-Coarse			
Lancing	292	3993903	710463	288	90	bedding vertical	Shale	Fine			
Lancing	293	3993925	710441	110	51	bedding inclined	Sandstone	Med-Fine			
Lancing	294	3994003	710406	329	55	bedding inclined	Shale				
Lancing	295	3994602	710455	0	0	bedding horizontal	Sandstone	Med-Fine			
Lancing	296	3994502	710079	0	0	outcrop	Sandstone	Med-Coarse			
Lancing	297	3994252	710014	8	21	bedding inclined	Sandstone	Med-Coarse			
Lancing	298	3994217	709997	190	18	bedding inclined	Sandstone	Med-Coarse			
Lancing	299	3994202	710008	158	22	bedding inclined	Sandstone	Med-Coarse			
Lancing	300	3994204	709995	194	18	bedding inclined	Sandstone	Med-Coarse			
Lancing	301	3994143	709926	169	6	bedding inclined	Sandstone	Med-Coarse			
Lancing	302	3994111	710055	166	16	bedding inclined	Sandstone	Med-Coarse			
Lancing	303	3994112	710097	0	0	float	Sandstone	Med-Fine			
Lancing	304	3994133	710293	270	63	bedding inclined	Sandstone	Med-Fine			
Lancing	305	3992850	704498	0	0	float	Sed Breccia	Med-Coarse			
Lancing	306	3992865	704417	316	0	joint horizontal	Sandstone	Med-Coarse			
Lancing	306	3992865	704417	299	0	joint horizontal	Sandstone	Med-Coarse			
Lancing	306	3992865	704417	293	0	joint horizontal	Sandstone	Med-Coarse			
Lancing	307	3992835	704335	0	0	float	Sandstone	Med-Fine			
Lancing	308	3992881	704223	119	4	bedding inclined	Sandstone	Med-Fine			
Lancing	308	3992881	704223	51	29	bedding inclined	Sandstone	Med-Fine			
Lancing	309	3992934	704271	329	21	bedding inclined	Sandstone	Med-Fine			
Lancing	310	3992948	704288	71	27	bedding inclined	Sandstone	Med-Fine			
Lancing	311	3992999	704325	95	26	bedding inclined	Sandstone	Med-Fine			
Lancing	312	3993022	704362	0	0						
Lancing	313	3993051	704389	84	56	bedding inclined	Sandstone	Med-Fine			
Lancing	314	3993059	704406	261	70	bedding inclined	Sandstone	Med-Fine			
Lancing	314	3993059	704406	279	2	bedding inclined	Sandstone	Med-Fine			

QUAD	STATION	UTM Northing	UTM Easting	STRIKE	INCLINE	TYPE	LITHOLOGY 1	GRAIN SIZE	LITHOLOGY 2	GRAIN SIZE 2	MODIFIER
Lancing	315	3993050	704415	70	36	bedding inclined	Siltstone	Med-Fine			
Lancing	316	3993080	704447	241	62	bedding inclined	Sandstone	Med-Fine			
Lancing	317	3993105	704457	65	25	bedding inclined	Siltstone				
Lancing	318	3993180	704465	234	64	bedding inclined	Sandstone	Med-Coarse			
Lancing	319	3993263	704472	0	0		Sandstone	Med-Fine			
Lancing	320	3993304	704500	174	45	bedding inclined	Conglomerate	Med-Coarse			
Lancing	320	3993304	704500	64	18	bedding inclined	Conglomerate	Med-Coarse			
Lancing	321	3993327	704544	0	0						
Lancing	322	3993343	704567	116	21	bedding inclined	Sandstone	Med-Fine			
Lancing	323	3994088	711331	105	8	bedding inclined	Sandstone	Med-Fine			
Lancing	324	3994117	711354	0	0						
Lancing	325	3994133	711387	45	4	bedding inclined	Sandstone	Med-Fine			
Lancing	326	3994142	711414	150	11	bedding inclined	Sandstone	Med-Fine			
Lancing	327	3994153	711442	124	8	bedding inclined	Sandstone	Med-Fine			
Lancing	328	3994161	711464	167	1	bedding inclined	Sandstone	Med-Fine			
Lancing	329	3993903	712859	354	2	bedding inclined	Shale				
Lancing	330	3993862	712747	4	4	bedding inclined	Shale	Med-Fine			
Lancing	331	3993845	712709	49	2	bedding inclined	Sandstone	Med-Fine	Shale	Fine	
Lancing	332	3993826	712690	95	17	bedding inclined	Shale		Siltstone		
Lancing	333	3993790	712668	110	2	bedding inclined	Shale				
Lancing	334	3993804	712581	0	0		Shale				
Lancing	335	3994854	712956	175	4	bedding inclined	Sandstone				
Lancing	336	3995173	713270	78	8	bedding inclined	Sandstone				
Lancing	337	3995999	713590	268	3	bedding inclined	Sandstone				
Lancing	338	3995939	713612	0	0	bedding horizontal	Shale				
Lancing	339	3995735	713668	285	4	bedding inclined	Sandstone	Med-Fine			
Lancing	340	3997585	706420	52	3	bedding inclined	Sandstone	Med-Fine			
Lancing	341	3997576	706195	306	31	bedding inclined	Shale				
Lancing	342	3997448	706159	54	3	bedding inclined	Sandstone	Med-Coarse			
Lancing	343	3997529	705846	0	0	outcrop	Sandstone	Med-Coarse			
Lancing	344	3997394	705902	24	2	bedding inclined	Sandstone	Med-Coarse			
Lancing	345	3997314	705746	349	15	bedding inclined	Sandstone	Med-Coarse			
Lancing	346	3997385	705666	0	0	bedding horizontal	Shale				
Lancing	347	3997443	705596	46	12	bedding inclined	Sandstone	Med-Coarse			
Lancing	348	3997511	705532	0	0	outcrop	Sandstone	Med-Coarse			

QUAD	STATION	UTM Northing	UTM Easting	STRIKE	INCLINE	TYPE	LITHOLOGY 1	GRAIN SIZE	LITHOLOGY 2	GRAIN SIZE 2	MODIFIER
Lancing	349	3997493	705446	0	0	bedding horizontal	Sandstone	Med-Coarse			
Lancing	350	3997433	704140	65	3	bedding inclined	Shale				
Lancing	351	3997709	703278	43	6	bedding inclined	Sandstone	Med-Fine			
Lancing	352	3999679	702956	233	2	bedding inclined	Sandstone	Med-Coarse			
Lancing	353	3999744	702966	235	1	bedding inclined	Sandstone	Med-Coarse			
Lancing	354	3998353	703682	55	3	bedding inclined	Sandstone	Med-Coarse			
Lancing	355	3998432	703560	0	0	outcrop	Sandstone	Med-Coarse			
Lancing	356	3998377	704128	0	0		Sandstone		Shale		
Lancing	357	3994077	711742	0	0	outcrop	Sandstone				
Lancing	358	3994128	711591	0	0	bedding horizontal	Sandstone	Fine			
Lancing	359	3994165	711569	2	1	bedding inclined	Shale	Med-Fine			
Lancing	360	3994180	711536	0	0	bedding horizontal	Sandstone	Medium			
Lancing	361	3994866	706650	41	29	bedding inclined	Sandstone	Medium			
Lancing	362	3994888	706574	225	29	bedding inclined	Sandstone	Med-Fine			
Lancing	363	3994913	706513	77	8	bedding inclined	Sandstone	Medium			
Lancing	364	3994727	705847	160	4	bedding inclined	Sandstone	Fine			
Lancing	365	3994592	705869	185	3	bedding inclined	Sandstone	Med-Coarse			
Lancing	366	3994451	705830	0	0	float	Sandstone	Fine			
Lancing	367	3998158	707269	291	6	bedding inclined	Sandstone	Med-Coarse			
Lancing	368	3998299	708398	59	4	bedding inclined	Sandstone	Med-Coarse			
Lancing	369	3998267	708593	2	1	bedding inclined	Sandstone	Med-Coarse			
Lancing	370	3998219	708758	345	5	bedding inclined	Shale				
Lancing	371	3998301	708982	202	2	bedding inclined	Shale				
Lancing	372	3998343	709038	212	12	bedding inclined	Sandstone	Med-Fine			
Lancing	373	3998996	709389	0	0	outcrop	Sandstone	Med-Fine			
Lancing	374	3998611	709393	0	0	outcrop	Shale		Sandstone		
Lancing	375	3997690	709812	64	3	bedding inclined	Sandstone	Med-Fine			
Lancing	376	3997595	709883	0	0	bedding horizontal	Sandstone	Fine			
Lancing	377	3997469	709915	0	0	outcrop	Sandstone		Shale		
Lancing	378	3997118	710068	100	6		Shale				
Lancing	379	3997113	709962	0	0	bedding horizontal	Shale				
Lancing	380	3997108	709357	0	9	bedding inclined	Sandstone	Med-Fine			
Lancing	381	3997765	709912	32	2	bedding inclined	Shale				
Lancing	382	3997897	710147	0	0	float	Sandstone				
Lancing	383	3997648	710369	41	1	bedding inclined	Sandstone	Med-Fine			
Lancing	384	3997762	710573	0	0	float	Shale				

QUAD	STATION	UTM Northing	UTM Easting	STRIKE	INCLINE	TYPE	LITHOLOGY 1	GRAIN SIZE	LITHOLOGY 2	GRAIN SIZE 2	MODIFIER
Lancing	385	3997798	710580	0	0	bedding horizontal	Sandstone				
Lancing	386	3997188	710759	280	3	bedding inclined	Sandstone				
Lancing	387	3997056	711319	266	1	bedding inclined	Sandstone	Med-Fine			
Lancing	388	3996331	711174	210	4	bedding inclined	Sandstone	Med-Fine			
Lancing	389	3996375	711219	210	4	bedding inclined	Sandstone	Med-Fine			
Lancing	390	3995556	712810	86	8	bedding inclined	Sandstone	Med-Coarse			
Lancing	391	3995438	712780	155	9	bedding inclined	Sandstone	Med-Coarse			
Lancing	392	3995394	712755	120	3	bedding inclined	Sandstone	Med-Coarse			
Lancing	393	3996533	711292	226	16	bedding inclined	Shale				
Lancing	394	3995451	712592	106	4	bedding inclined	Sandstone	Med-Coarse			
Lancing	395	3995521	712624	41	11	bedding inclined	Sandstone	Med-Coarse			
Lancing	396	3995456	712283	235	16	bedding inclined	Sandstone	Med-Fine			
Lancing	397	3995302	712200	239	5	bedding inclined	Shale				
Lancing	398	3995337	712012	230	7	bedding inclined	Sandstone	Med-Fine			
Lancing	399	3996013	711310	22	3	bedding inclined	Sandstone	Med-Fine			
Lancing	400	3996552	711394	281	3	bedding inclined	Sandstone	Med-Fine	Shale		
Lancing	401	3996711	711328	161	5	bedding inclined	Shale	Med-Fine	Sandstone	Med-Fine	
Lancing	402	3998226	709843	231	9	bedding inclined	Sandstone	Med-Fine			
Lancing	403	3998243	709827	0	0	bedding horizontal	Sandstone		Shale		
Lancing	404	3998510	710088	0	0	bedding horizontal	Shale				
Lancing	405	3999100	710458	0	0		Shale		Sandstone	Med-Coarse	
Lancing	406	3999477	710770	279	4	bedding inclined	Shale		Sandstone	Med-Fine	
Lancing	407	3989232	709262	0	0	outcrop	Sandstone	Med-Coarse			
Lancing	408	3989145	709303	335	7	bedding inclined	Sandstone	Med-Coarse			
Lancing	409	3988967	709279	0	0	float	Shale	Med-Fine			
Lancing	410	3989013	709101	307	5	bedding inclined	Shale	Medium			
Lancing	411	3989018	709050	330	8	bedding inclined	Shale	Medium			
Lancing	412	3989020	708977	336	7	bedding inclined	Siltstone	Medium			
Lancing	413	3988960	708902	300	8	bedding inclined	Sandstone	Medium			
Lancing	414	3988901	708860	266	4	bedding inclined	Sandstone	Medium			
Lancing	416	3988854	708821	134	3	bedding inclined	Sandstone	Medium			
Lancing	417	3988820	708810	0	0	bedding horizontal	Sandstone	Medium			
Lancing	418	3988775	708806	176	5	bedding inclined	Sandstone	Medium			
Lancing	419	3988761	708768	89	6	bedding inclined	Sandstone	Med-Fine			

QUAD	STATION	UTM Northing	UTM Easting	STRIKE	INCLINE	TYPE	LITHOLOGY 1	GRAIN SIZE	LITHOLOGY 2	GRAIN SIZE 2	MODIFIER
Lancing	420	3988469	708072	84	9	bedding inclined	Sandstone	Med-Fine			
Lancing	421	3988710	708054	96	13	bedding inclined	Sandstone	Med-Coarse			
Lancing	422	3988994	708262	333	11	bedding inclined	Sandstone	Med-Coarse			
Lancing	423	3987586	711751	0	0	outcrop	Sandstone	Med-Fine			
Lancing	424	3987665	711782	189	12	bedding inclined	Sandstone	Med-Fine			
Lancing	425	3987671	711789	48	6	bedding inclined	Sandstone	Med-Fine			
Lancing	426	3988073	711841	54	6	bedding inclined	Sandstone	Medium			
Lancing	427	3987636	711598	58	11	bedding inclined	Sandstone	Med-Fine			
Lancing	428	3986750	711201	71	3	bedding inclined	Sandstone	Med-Coarse			
Lancing	429	3986747	711232	0	0	bedding horizontal	Sandstone	Med-Coarse			
Lancing	430	3986719	711242	85	7	bedding inclined	Sandstone	Med-Coarse			
Lancing	431	3986716	711242	48	10	bedding inclined	Sandstone	Med-Coarse			
Lancing	432	3986685	711226	288	6	bedding inclined	Sandstone	Med-Coarse			
Lancing	433	3986684	711298	276	11	bedding inclined	Sandstone				
Lancing	434	3986622	711305	21	14	bedding inclined	Sandstone				
Lancing	435	3986443	711385	38	13	bedding inclined	Sandstone	Med-Coarse			
Lancing	436	3986293	711498	285	4	bedding inclined	Sandstone	Med-Coarse			
Lancing	437	3992694	709702	51	21	bedding inclined	Shale				
Lancing	438	3995012	709866	60	19	fold hinge	Sandstone	Med-Coarse			
Lancing	439	3995493	709705	0	0	outcrop	Shale		Sandstone	Med-Coarse	
Lancing	440	3995262	709803	264	6	bedding inclined	Sandstone	Med-Coarse			
Lancing	441	3995247	709666	223	8	bedding inclined	Sandstone	Med-Coarse			
Lancing	442	3995352	709423	139	13	bedding inclined	Sandstone	Med-Coarse			
Lancing	443	3995166	709018	206	33	bedding inclined	Sandstone	Medium			
Lancing	444	3995139	709024	41	14	bedding inclined	Sandstone	Medium			
Lancing	445	3994991	709149	0	0	float	Sandstone	Med-Coarse			
Lancing	446	3994978	709223	0	0	float	Sandstone	Med-Fine			
Lancing	447	3995041	708900	89	10	bedding inclined	Sandstone	Med-Coarse			
Lancing	448	3995157	708833	0	0	float	Sandstone	Fine			
Lancing	449	3995321	708848	81	18	bedding inclined	Shale				
Lancing	450	3995349	708848	260	3	bedding inclined	Sandstone	Med-Coarse			
Lancing	451	3995370	708848	106	4	bedding inclined	Siltstone	Med-Fine			
Lancing	452	3995399	708838	65	14	bedding inclined	Sandstone	Med-Coarse			
Lancing	453	3995414	708851	95	29	bedding inclined	Sandstone	Med-Coarse			
Lancing	454	3995483	708851	69	15	bedding inclined	Sandstone	Med-Coarse			

QUAD	STATION	UTM Northing	UTM Easting	STRIKE	INCLINE	TYPE	LITHOLOGY 1	GRAIN SIZE	LITHOLOGY 2	GRAIN SIZE 2	MODIFIER
Lancing	455	3995531	708980	95	4	bedding inclined	Sandstone	Med-Coarse			
Lancing	456	3999286	713033	24	2	bedding inclined	Sandstone	Fine			
Lancing	457	3999286	712945	0	0		Shale				
Lancing	458	3999319	712908	4	5	bedding inclined	Siltstone				
Lancing	459	3999328	712866	44	29	bedding inclined	Siltstone				
Lancing	460	3999365	712806	54	2	bedding inclined	Siltstone				
Lancing	461	3999388	712774	118	4	bedding inclined	Sandstone	Fine	Shale		
Lancing	462	3999402	712737	41	2	bedding inclined	Sandstone	Fine			
Lancing	463	3999905	712166	1	1	bedding inclined	Shale				
Lancing	463	3999905	712166	226	4	bedding inclined	Shale				
Lancing	463	3999905	712166	145	79	bedding inclined	Shale				
Lancing	464	4000156	711575	61	3	bedding inclined	Shale		Sandstone	Med-Fine	
Lancing	464	4000156	711575	56	1	bedding inclined	Shale		Sandstone	Med-Fine	
Lancing	465	3999452	711347	0	0		Sandstone	Med-Coarse			
Lancing	466	3999532	711332	37	8	bedding inclined	Sandstone	Med-Coarse			
Lancing	467	3999670	710934	53	8	bedding inclined	Sandstone	Med-Coarse			
Lancing	468	3999614	711209	226	2	bedding inclined	Sandstone	Med-Coarse			
Lancing	469	3999985	711505	62	14	bedding inclined	Sandstone	Med-Fine			
Lancing	470	3999938	711437	0	0	bedding horizontal	Shale				
Lancing	471	4000068	711738	0	0		Sandstone	Med-Fine	Shale		
Lancing	472	3998885	712986	0	0		Sandstone	Med-Fine			
Lancing	473	3998469	713281	0	0	outcrop	Sandstone	Med-Fine			
Lancing	474	3998627	713058	139	2	bedding inclined	Sandstone	Med-Fine			
Lancing	475	3999437	713632	295	8	bedding inclined	Sandstone	Med-Fine			
Lancing	476	3999552	713602	19	10	bedding inclined	Sandstone	Med-Fine	Shale		
Lancing	476	3999552	713602	19	16	bedding inclined	Sandstone	Med-Fine	Shale		
Lancing	477	4000050	713650	136	9	bedding inclined	Shale				
Lancing	478	3999920	713705	134	8	bedding inclined	Shale		Sandstone	Med-Fine	
Lancing	479	3999579	713599	0	0		Shale		Sandstone	Med-Fine	
Lancing	480	3992297	709451	304	2	bedding inclined	Shale				
Lancing	481	3992291	709409	300	3	bedding inclined	Sandstone	Med-Coarse			
Lancing	482	3992325	709349	296	2	bedding inclined	Shale				
Lancing	483	3992313	709240	240	7	bedding inclined	Sandstone	Medium			
Lancing	484	3992053	708975	245	10	bedding inclined	Sandstone	Med-Fine			
Lancing	485	3992110	708826	268	16	bedding inclined	Sandstone	Med-Fine			

QUAD	STATION	UTM Northing	UTM Easting	STRIKE	INCLINE	TYPE	LITHOLOGY 1	GRAIN SIZE	LITHOLOGY 2	GRAIN SIZE 2	MODIFIER
Lancing	486	3992006	708870	238	1	bedding inclined	Sandstone	Med-Coarse			
Lancing	487	3991894	708931	0	0	outcrop	Sandstone	Medium			
Lancing	488	3991762	708920	212	16	bedding inclined	Sandstone	Med-Coarse			
Lancing	489	3991746	708913	329	3	bedding inclined	Sandstone	Medium			
Lancing	490	3991651	708901	275	14	bedding inclined	Sandstone	Medium			
Lancing	491	3991673	708587	212	8	bedding inclined	Sandstone	Med-Fine			
Lancing	492	3991706	708585	256	6	bedding inclined	Sandstone	Med-Fine			
Lancing	493	3991716	708401	0	0	bedding horizontal	Sandstone	Med-Coarse			
Lancing	494	3991626	708805	316	9	bedding inclined	Shale				
Lancing	495	3991716	708198	312	3	bedding inclined	Sandstone	Medium			
Lancing	496	3991608	708717	298	11	bedding inclined	Shale				
Lancing	497	3991972	707478	0	0	outcrop	Sandstone	Med-Fine			
Lancing	498	3992226	707422	199	9	bedding inclined	Sandstone	Med-Fine			
Lancing	499	3992453	707227	41	4	bedding inclined	Sandstone	Med-Fine			
Lancing	500	3992535	707222	296	4	bedding inclined	Sandstone	Fine			
Lancing	501	3992569	707202	276	2	bedding inclined	Sandstone	Med-Fine			
Lancing	502	3992796	706867	101	7	bedding inclined	Shale				
Lancing	503	3992213	708477	311	18	bedding inclined	Shale				
Lancing	504	3992156	708562	0	0	float	Sandstone	Medium	Shale		
Lancing	505	3992148	708658	298	9	bedding inclined	Sandstone	Med-Fine			
Lancing	506	3992169	708723	302	11	bedding inclined	Sandstone	Med-Fine			
Lancing	507	3992424	710311	0	0	bedding horizontal	Sandstone	Med-Fine			
Lancing	508	3992538	710001	11	2	bedding inclined	Sandstone	Med-Fine			
Lancing	509	3993621	710212	90	2	bedding inclined	Sandstone	Medium			
Lancing	510	3988678	711551	58	11	bedding inclined	Sandstone	Med-Coarse			
Lancing	511	3988456	711739	34	6	bedding inclined	Sandstone	Med-Coarse			
Lancing	512	3988772	712072	265	7	bedding inclined	Sandstone	Med-Coarse			
Lancing	513	3988614	712033	209	9	bedding inclined	Sandstone	Med-Coarse			
Lancing	514	3988712	712077	11	4	bedding inclined	Sandstone	Med-Coarse			
Lancing	515	3988178	712664	318	6	bedding inclined	Sandstone	Med-Fine			
Lancing	516	3988303	712926	0	0	outcrop	Siltstone	Med-Fine			
Lancing	518	3988325	712932	49	7	bedding inclined	Sandstone	Med-Fine			
Lancing	519	3988354	712935	0	0	outcrop	Shale				
Lancing	520	3988485	712940	0	0	float	Sandstone	Med-Coarse			
Lancing	521	3988610	712859	0	0	float	Sandstone	Med-Coarse			

QUAD	STATION	UTM Northing	UTM Easting	STRIKE	INCLINE	TYPE	LITHOLOGY 1	GRAIN SIZE	LITHOLOGY 2	GRAIN SIZE 2	MODIFIER
Lancing	522	3988769	713252	54	4	bedding inclined	Sandstone	Med-Coarse			
Lancing	523	3989108	713287	0	0	float	Sandstone	Med-Fine			
Lancing	524	3993753	710532	127	6	bedding inclined	Sandstone	Med-Coarse	Shale		
Lancing	524	3993753	710532	119	19	bedding inclined	Sandstone	Med-Coarse	Shale		
Lancing	525	3993736	710774	69	73	bedding overturned	Siltstone	Med-Fine			
Lancing	526	3993747	710759	119	20	bedding inclined	Shale				
Lancing	527	3993721	710799	0	0		Shale				
Lancing	528	3993672	710847	117	24	bedding inclined	Siltstone				
Lancing	529	3993650	710862	141	27	bedding inclined	Siltstone				
Lancing	530	3993632	710974	124	50	bedding inclined	Sandstone	Med-Fine			Brecciated
Lancing	531	3993672	710961	135	36	bedding inclined	Sandstone	Med-Fine			Brecciated
Lancing	532	3993606	711376	114	21	bedding inclined	Sandstone	Med-Coarse			
Lancing	533	3993249	711820	116	9	bedding inclined	Conglomerate	Coarse			
Lancing	533	3993249	711820	108	0	joint inclined	Conglomerate	Coarse			
Lancing	534	3993180	711897	119	6	bedding inclined	Conglomerate	Coarse			
Lancing	535	3993060	711741	114	59	bedding inclined	Sandstone	Med-Coarse			
Lancing	536	3993095	711756	118	19	bedding inclined	Sandstone	Med-Coarse			
Lancing	537	3993117	711791	148	26	bedding inclined	Sandstone	Medium			
Lancing	538	3993157	711826	125	10	bedding inclined	Shale				
Lancing	539	3993197	711873	168	19	bedding inclined	Sandstone	Med-Coarse			
Lancing	540	3993137	711988	122	18	bedding inclined	Sandstone				
Lancing	541	3992359	713900	114	5	bedding inclined	Sandstone				
Lancing	542	3990355	709089	304	7	bedding inclined	Sandstone				
Lancing	543	3990256	709137	9	2	bedding inclined	Sandstone				
Lancing	544	3989646	709386	338	13	bedding inclined	Sandstone				
Lancing	545	3989614	709440	351	3	bedding inclined	Sandstone				
Lancing	546	3989471	709140	0	0	bedding horizontal	Sandstone				
Lancing	547	3989542	709087	0	0		Sandstone				
Lancing	548	3990923	710996	171	19	bedding inclined	Sandstone	Med-Coarse			
Lancing	549	3990920	710990	179	6	bedding inclined	Sandstone	Med-Coarse			
Lancing	550	3990840	711206	249	15	bedding inclined	Sandstone	Med-Coarse			
Lancing	551	3990713	711255	222	9	bedding inclined	Sandstone	Med-Coarse			
Lancing	552	3990688	711688	219	7	bedding inclined	Sandstone	Med-Coarse			
Lancing	553	3990583	711836	0	0		Sandstone	Med-Coarse	Shale	Fine	

QUAD	STATION	UTM Northing	UTM Easting	STRIKE	INCLINE	TYPE	LITHOLOGY 1	GRAIN SIZE	LITHOLOGY 2	GRAIN SIZE 2	MODIFIER
Lancing	554	3990376	712264	206	20	bedding inclined	Shale				
Lancing	555	3990374	712338	0	0	float	Sandstone				
Lancing	556	3990445	712515	314	5	bedding inclined	Sandstone	Med-Fine			
Lancing	557	3990562	712659	0	0	float	Shale				
Lancing	558	3990383	712525	0	0	float	Shale				
Lancing	559	3990508	712763	0	0	float	Sandstone		Shale		
Lancing	560	3990558	712835	0	0	outcrop	Shale				
Lancing	561	3990684	711286	21	2	bedding inclined	Sandstone	Med-Coarse			
Lancing	562	3991814	703786	30	26	bedding inclined	Sandstone	Med-Coarse			
Lancing	563	3991732	703874	34	14	bedding inclined	Sandstone	Med-Coarse			
Lancing	564	3991679	703945	39	19	bedding inclined	Sandstone	Med-Coarse			
Lancing	565	3991558	705047	327	5	bedding inclined	Sandstone	Med-Fine			
Lancing	566	3991558	705103	0	0	outcrop	Sandstone	Med-Fine			
Lancing	567	3991519	705224	136	11	bedding inclined	Sandstone	Med-Fine			
Lancing	568	3991587	705388	0	0	float	Sandstone	Med-Coarse			
Lancing	569	3991669	705357	80	4	bedding inclined	Sandstone	Med-Coarse			
Lancing	570	3991696	705385	66	5	bedding inclined	Sandstone	Med-Coarse			
Lancing	571	3991525	705645	31	3	bedding inclined	Sandstone	Med-Coarse			
Lancing	572	3991570	705852	0	0	outcrop	Sandstone	Med-Coarse			
Lancing	573	3992439	704959	54	18	bedding inclined	Sandstone	Med-Coarse			
Lancing	574	3992550	704918	43	20	bedding inclined	Sandstone	Med-Coarse			
Lancing	575	3992713	704882	36	34	bedding inclined	Sandstone	Med-Coarse			
Lancing	576	3992743	704882	53	14	bedding inclined	Sandstone	Med-Coarse			
Lancing	577	3992741	704651	54	19	bedding inclined	Sandstone	Med-Fine			
Lancing	578	3991029	705310	211	3	bedding inclined	Sandstone	Med-Coarse			
Lancing	579	3991152	705102	186	2	bedding inclined	Sandstone	Med-Coarse			
Lancing	580	3991176	705173	68	6	bedding inclined	Sandstone	Med-Coarse			
Lancing	581	3991029	705262	304	4	bedding inclined	Sandstone	Med-Coarse			
Lancing	582	3992971	709515	104	4	bedding inclined	Sandstone	Med-Fine			
Lancing	583	3992918	709462	46	14	bedding inclined	Siltstone	Fine			
Lancing	584	3992937	709451	34	4	bedding inclined	Shale				
Lancing	585	3992949	709501	209	5	bedding inclined	Sandstone	Med-Fine			
Lancing	586	3992956	709457	0	0	float	Other				
Lancing	587	3992963	709349	99	3	bedding inclined	Sandstone	Med-Fine			
Lancing	588	3992987	709298	84	5	bedding inclined	Sandstone	Med-Coarse			
Lancing	589	3993143	709296	54	4	bedding inclined	Shale				

QUAD	STATION	UTM Northing	UTM Easting	STRIKE	INCLINE	TYPE	LITHOLOGY 1	GRAIN SIZE	LITHOLOGY 2	GRAIN SIZE 2	MODIFIER
Lancing	590	3993172	709292	0	0	float	Shale		Sandstone	Med-Fine	
Lancing	591	3993254	709259	261	7	bedding inclined	Sandstone	Med-Coarse			
Lancing	592	3993587	709247	0	0	float	Shale				
Lancing	593	3993394	709176	0	0	float	Sandstone	Med-Fine			
Lancing	594	3992822	708909	56	15	bedding inclined	Sandstone	Med-Coarse			
Lancing	595	3999240	702643	124	3	bedding inclined	Shale				
Lancing	596	3999251	702651	0	0	outcrop	Sandstone		Shale		
Lancing	597	3999339	702735	27	5	bedding inclined	Sandstone	Medium			
Lancing	598	3997412	702720	41	24	other	Sandstone	Med-Coarse			
Lancing	598	3997412	702720	134	3	other	Sandstone	Med-Coarse			
Lancing	599	3997080	704689	156	3	bedding inclined	Sandstone	Med-Coarse			
Lancing	600	3996941	704662	0	0	outcrop	Sandstone	Med-Coarse			
Lancing	601	3996348	704294	0	0	outcrop	Shale				
Lancing	602	3996253	704206	0	0	outcrop	Sandstone	Med-Coarse			
Lancing	603	3996104	704086	159	6	bedding inclined	Sandstone	Med-Coarse			
Lancing	604	3995964	703672	151	2	bedding inclined	Sed Breccia	Med-Coarse			
Lancing	605	3995769	702586	99	2	bedding inclined	Shale				
Lancing	606	3995253	702865	0	0	outcrop	Sandstone	Med-Coarse			
Lancing	607	3994899	703101	0	0		Shale				
Lancing	608	3995114	702647	0	0		Sandstone	Med-Coarse			
Lancing	609	3994950	702650	62	8	bedding inclined	Sandstone	Med-Coarse			
Lancing	610	3995513	704352	0	0	outcrop	Other				
Lancing	611	3995382	703937	155	4	bedding inclined	Shale				
Lancing	612	3995333	703495	29	9	bedding inclined	Shale				
Lancing	613	3995348	703095	339	2	bedding inclined	Shale				
Lancing	614	3996990	704364	0	0	outcrop	Sandstone	Med-Coarse			
Lancing	615	3997095	704029	0	0		Sandstone	Med-Coarse			
Lancing	616	3997031	703538	0	0	outcrop	Sandstone	Med-Coarse			
Lancing	617	3997130	703738	0	0	outcrop	Sandstone	Med-Coarse			
Lancing	618	3997475	705540	0	0		Sandstone		Shale		
Lancing	619	3997512	706019	0	0	outcrop	Shale				
Lancing	620	3993941	710138	292	4	bedding inclined	Sandstone	Medium			
Lancing	621	3994007	709802	0	0	outcrop	Shale				
Lancing	622	3994006	709342	186	3	bedding inclined	Shale				
Lancing	623	3994126	709265	0	0	outcrop	Sandstone	Medium	Shale		
Lancing	624	3994165	709386	0	0	outcrop	Shale				
Lancing	625	3994249	709069	89	8	bedding inclined	Sandstone	Medium			
Lancing	626	3994307	709028	86	14	bedding inclined	Shale				
Lancing	627	3994411	708967	89	19	bedding inclined	Sandstone	Med-Coarse			
Lancing	628	3994476	708925	82	11	bedding inclined	Sandstone	Med-Coarse			

QUAD	STATION	UTM Northing	UTM Easting	STRIKE	INCLINE	TYPE	LITHOLOGY 1	GRAIN SIZE	LITHOLOGY 2	GRAIN SIZE 2	MODIFIER
Lancing	629	3994546	708892	62	12	bedding inclined	Sandstone	Med-Coarse			
Lancing	630	3994530	708762	83	20	bedding inclined	Sandstone	Med-Coarse			
Lancing	631	3994535	708644	0	0		Sandstone	Med-Coarse			
Lancing	632	3994348	709050	71	17	bedding inclined	Shale				
Lancing	633	3994225	709512	94	24	bedding inclined	Shale				
Lancing	634	3994289	709817	59	9	bedding inclined	Sandstone	Fine			
Lancing	635	3994346	709883	106	10	bedding inclined	Sandstone	Med-Fine			
Lancing	636	3994620	709925	321	73	bedding inclined	Sandstone	Med-Coarse			
Lancing	637	3994680	709867	121	20	bedding inclined	Siltstone	Medium			
Lancing	638	3994716	709830	299	4	bedding inclined	Shale				
Lancing	639	3994740	709799	0	0	outcrop	Shale				
Lancing	640	3994755	709776	320	13	bedding inclined	Shale				
Lancing	641	3994878	709692	86	20	bedding inclined	Shale	Medium			
Lancing	642	3994601	709921	0	0	outcrop	Sed Breccia	Med-Coarse			
Lancing	643	3994650	709660	64	21	bedding inclined	Sandstone	Med-Coarse			
Lancing	644	3994810	709489	79	14	bedding inclined	Sandstone				
Lancing	645	3994773	709525	61	19	bedding inclined	Sandstone	Medium			
Lancing	646	3994723	709576	49	24	bedding inclined	Sandstone	Med-Fine			
Lancing	647	3994520	709821	0	0	outcrop	Sandstone	Fine			
Lancing	648	3994422	709851	184	7	bedding inclined	Sandstone	Med-Coarse	Shale		
Lancing	649	3994426	709531	0	0	float	Shale				
Lancing	650	3994343	709596	0	0	float	Shale				
Lancing	651	3994365	709672	0	0		Siltstone				
Lancing	652	3994800	709854	0	0		Shale				
Lancing	653	3994818	709859	0	0		Conglomerate				
Lancing	654	3994845	709822	118	4	bedding inclined	Conglomerate				
Lancing	655	3995116	709681	179	4	bedding inclined	Shale		Conglomerate		
Lancing	656	3995202	709616	0	0	bedding horizontal	Conglomerate				
Lancing	657	3995284	709560	185	11	bedding inclined	Conglomerate				
Lancing	658	3995113	709576	0	0	float	Sandstone				
Lancing	659	3995194	709509	0	0	float	Shale				
Lancing	660	3995183	709446	0	0	float	Sandstone				
Lancing	661	3995236	709279	258	4	bedding inclined	Siltstone				
Lancing	662	3995294	709185	15	26	bedding inclined	Shale		Siltstone		
Lancing	663	3995317	709162	26	11	bedding inclined	Sandstone				
Lancing	664	3995352	709016	114	5	bedding inclined	Sandstone				
Lancing	665	3993812	709880	42	4	bedding inclined	Sandstone				

QUAD	STATION	UTM Northing	UTM Easting	STRIKE	INCLINE	TYPE	LITHOLOGY 1	GRAIN SIZE	LITHOLOGY 2	GRAIN SIZE 2	MODIFIER
Lancing	666	3993628	709723	0	0	outcrop	Sandstone				
Lancing	667	3998014	705907	39	1	bedding inclined	Shale				
Lancing	668	3998136	706005	43	2	bedding inclined	Siltstone				
Lancing	669	3998183	706044	0	0	bedding horizontal	Sandstone				
Lancing	670	3998138	705944	41	3	bedding inclined	Conglomerate				
Lancing	671	3998264	706108	0	0	outcrop	Conglomerate				
Lancing	672	3998289	706054	0	0	bedding horizontal	Conglomerate				
Lancing	673	3998238	705908	279	2	bedding inclined	Conglomerate				
Lancing	674	3998259	705751	328	1	bedding inclined	Sandstone				
Lancing	675	3998267	705693	354	2	bedding inclined	Shale				
Lancing	676	3998230	705630	0	0	bedding horizontal	Conglomerate		Shale		
Lancing	677	3997850	705680	0	0	outcrop	Conglomerate				
Lancing	678	3997762	705637	0	0	outcrop	Conglomerate				
Lancing	679	3997667	705741	0	0	outcrop	Conglomerate				
Lancing	680	3994611	708538	86	35	bedding inclined	Sandstone	Med-Coarse			
Lancing	681	3994673	708493	0	0	float	Sandstone	Med-Fine			
Lancing	682	3995061	708325	0	0	float	Sed Breccia	Med-Coarse			
Lancing	683	3995110	708299	0	0	outcrop	Sed Breccia	Med-Coarse			
Lancing	684	3995142	708306	260	16	bedding inclined	Sed Breccia	Med-Coarse			
Lancing	685	3995165	708364	0	0	outcrop	Sed Breccia	Med-Coarse			
Lancing	686	3995248	708442	0	0	float	Sed Breccia	Med-Coarse			
Lancing	687	3995234	708472	0	0	float	Shale				
Lancing	688	3995180	708502	26	5	bedding inclined	Sandstone	Med-Fine			
Lancing	689	3995197	708519	54	2	fold hinge	Sandstone	Med-Fine			
Lancing	690	3995213	708534	0	0	bedding horizontal	Shale				
Lancing	691	3995255	708550	0	0	float	Conglomerate				
Lancing	692	3995302	708565	0	0	outcrop	Shale	Med-Fine			
Lancing	693	3995369	708587	0	0	bedding horizontal	Sandstone	Med-Coarse			
Lancing	694	3995275	708512	0	0	bedding horizontal	Sandstone	Med-Fine			
Lancing	695	3995123	707948	0	0	outcrop	Sandstone	Med-Coarse			
Lancing	696	3995250	707885	0	0	float	Sandstone	Med-Fine			
Lancing	697	3995206	707319	0	0	outcrop	Shale				
Lancing	698	3995160	707554	0	0	float	Sandstone	Med-Coarse			
Lancing	699	3994761	707810	19	10	bedding inclined	Sandstone	Med-Coarse			
Lancing	700	3994810	707890	88	4	bedding inclined	Sandstone	Med-Coarse			
Lancing	701	3994605	708211	0	0	float	Sandstone	Med-Coarse			
Lancing	702	3991824	702982	0	0	float	Sandstone	Med-Coarse			
Lancing	703	3991833	702984	0	0	outcrop	Sandstone	Med-Coarse			
Lancing	704	3992007	702913	0	0	float	Sed Breccia	Coarse			
Lancing	705	3992041	702861	0	0	float	Sed Breccia	Med-Fine			
Lancing	706	3992070	702767	75	36	bedding inclined	Sandstone	Med-Fine			

QUAD	STATION	UTM Northing	UTM Easting	STRIKE	INCLINE	TYPE	LITHOLOGY 1	GRAIN SIZE	LITHOLOGY 2	GRAIN SIZE 2	MODIFIER
Lancing	707	3991968	702670	0	0	float	Sed Breccia	Med-Fine			
Lancing	708	3991734	702932	0	0	float	Sandstone	Coarse			
Lancing	709	3991683	702978	0	0	float	Conglomerate	Coarse			
Lancing	710	3991652	702990	41	42	bedding inclined	Sandstone	Med-Coarse			
Lancing	711	3991609	703083	41	65	bedding inclined	Sandstone	Med-Fine			
Lancing	712	3991391	703230	0	0	float	Sandstone	Med-Coarse			
Lancing	713	3991410	703178	44	17	bedding inclined	Sandstone	Med-Fine			
Lancing	714	3991207	702992	31	9	bedding inclined	Sandstone	Med-Fine			
Lancing	715	3991232	703016	94	6	bedding inclined	Sandstone	Med-Fine			
Lancing	716	3991236	702646	0	0	outcrop	Sandstone	Med-Coarse			
Lancing	717	3991272	702572	0	0	float	Sandstone	Med-Fine			
Lancing	718	3991330	702503	21	22	bedding inclined	Sandstone	Med-Coarse			
Lancing	719	3991851	703109	0	0		Conglomerate				
Lancing	720	3991892	703125	0	0	float	Conglomerate				
Lancing	721	3991990	703129	66	24	bedding inclined	Conglomerate				
Lancing	722	3992001	703145	59	39	bedding inclined	Conglomerate				
Lancing	723	3992084	703206	0	0	float	Sandstone				
Lancing	724	3992132	703192	0	0						
Lancing	725	3992253	703131	0	0	float	Sandstone				
Lancing	726	3992231	703146	0	0						
Lancing	727	3992291	703164	0	0	float	Sandstone				
Lancing	728	3992271	703200	0	0		Conglomerate				
Lancing	729	3992213	703306	0	0	float	Sandstone				
Lancing	730	3992190	703316	0	0	float	Sandstone				
Lancing	731	3992096	703386	0	0	float	Conglomerate				
Lancing	732	3992128	703433	90	65	bedding inclined	Sandstone				
Lancing	733	3992175	703689	0	0		Colluvium				
Lancing	734	3992176	703718	0	0	float	Siltstone				
Lancing	735	3992057	703750	0	0	float	Siltstone				
Lancing	736	3991734	703277	0	0		Sandstone				
Lancing	737	3991731	703201	70	58	bedding inclined	Siltstone				
Lancing	738	3991732	703192	74	44	bedding inclined	Sandstone				
Lancing	739	3991796	703116	0	0		Sandstone				
Lancing	740	3991811	703086	0	0	outcrop	Sed Breccia				
Lancing	741	3991812	703044	0	0		Conglomerate				
Lancing	742	3991984	703730	29	34	bedding inclined	Sandstone		Shale		
Lancing	743	3992017	703746	34	90	bedding vertical	Shale				
Lancing	744	3992046	703771	71	54	bedding inclined	Sandstone				
Lancing	745	3992098	703821	54	57	bedding inclined	Sandstone		Shale		
Lancing	746	3992164	703951	55	48	bedding inclined	Sandstone		Shale		
Lancing	1	3988945	706022	260	23	bedding inclined	Sandstone		Shale		

QUAD	STATION	UTM Northing	UTM Easting	STRIKE	INCLINE	TYPE	LITHOLOGY 1	GRAIN SIZE	LITHOLOGY 2	GRAIN SIZE 2	MODIFIER
Lancing	2	3986684	705317	0	0	float	Conglomerate	Med-Coarse			
Lancing	4	3992070	702757	55	65	bedding inclined	Shale				
Lancing	5	3992188	702831	0	0		Sandstone				
Lancing	6	3992737	703155	0	0	float	Conglomerate				
Lancing	7	3992992	703964	260	46	bedding inclined	Sandstone				
Lancing	8	3993480	704441	0	0						
Lancing	9	3993474	705697	0	0		Sandstone				
Lancing	10	3993389	705743	42	19	bedding inclined	Shale				
Lancing	11	3993385	705671	48	19	bedding inclined	Sandstone				
Lancing	12	3993279	705479	46	21	bedding inclined	Sandstone				
Lancing	13	3993217	705414	55	17	bedding inclined	Sandstone				
Lancing	14	3992278	703348	0	0		Sandstone	Med-Coarse			
Lancing	15	3992615	703675	0	0	float	Conglomerate				Conglom-eratic
Lancing	16	3992652	703683	0	0	outcrop	Sandstone	Med-Coarse			
Lancing	17	3992708	703698	216	29	bedding inclined	Sandstone	Medium			
Lancing	18	3992697	703625	0	0	outcrop	Sandstone	Med-Coarse			
Lancing	19	3992502	702923	242	56	bedding inclined	Sandstone				
Hebberts-burg	1	3992572	158055	101	23	outcrop	Sandstone	Med-Fine			
Hebberts-burg	2	3992660	157993	0	0						X-Bedded
Hebberts-burg	3	3992660	157993	350	29	outcrop	Sandstone				
Hebberts-burg	4	3992801	157990	0	0						
Hebberts-burg	5	3992394	157893	0	0						
Hebberts-burg	6	3990506	701175	85	7	bedding inclined	Shale	Med-Fine			
Hebberts-burg	7	3990639	701218	0	0	outcrop	Shale				
Hebberts-burg	8	3989416	702215	0	0	outcrop	Sandstone				
Hebberts-burg	9	3989414	702215	125	25	bedding inclined	Sandstone				
Hebberts-burg	10	3989571	705094	295	8	bedding inclined	Shale				
Hebberts-burg	11	3989595	705372	295	8	bedding inclined	Shale				
Hebberts-burg	12	3989488	705471	0	0	float	Sandstone		Shale		
Hebberts-burg	13	3989731	705631	232	13	bedding inclined	Shale				
Hebberts-burg	14	3989666	705604	0	0	float	Sandstone				
Hebberts-burg	15	3995949	702437	0	0	outcrop	Sandstone	Med-Fine			
Hebberts-burg	16	3995781	702524	0	0		Shale				
Hebberts-burg	17	3994831	702538	0	0	outcrop	Sandstone	Med-Coarse			
Hebberts-burg	18	3992030	702627	218	78	bedding inclined	Sandstone	Med-Fine			
Hebberts-burg	19	3992000	702395	0	0	outcrop	Sandstone	Med-Fine			

QUAD	STATION	UTM Northing	UTM Easting	STRIKE	INCLINE	TYPE	LITHOLOGY 1	GRAIN SIZE	LITHOLOGY 2	GRAIN SIZE 2	MODIFIER
Hebberts-burg	20	3992023	702412	241	25	bedding inclined	Sandstone	Med-Fine			
Hebberts-burg	21	3991947	702368	0	0	float	Shale				
Hebberts-burg	22	3991793	702605	0	0	float	Sandstone	Medium			
Hebberts-burg	23	3991329	702498	21	22	bedding inclined	Sandstone	Med-Coarse			
Hebberts-burg	24	3991380	702442	44	40	bedding inclined	Sandstone	Med-Coarse			
Hebberts-burg	25	3991687	702190	0	0	float	Conglomerate	Coarse			
Hebberts-burg	26	3991752	702178	0	0	float	Sandstone	Med-Coarse			
Hebberts-burg	27	3991752	702012	0	0	outcrop	Sandstone	Med-Coarse			
Hebberts-burg	28	3991639	701919	106	8	bedding inclined	Sandstone	Med-Coarse			
Hebberts-burg	29	3991724	701906	0	0	float	Sandstone	Med-Coarse			
Hebberts-burg	30	3991874	701620	334	6	bedding inclined	Sandstone	Med-Fine			
Hebberts-burg	31	3991706	701527	0	0	outcrop	Sandstone	Medium			
Hebberts-burg	32	3991605	701742	0	0	outcrop	Conglomerate	Coarse			
Hebberts-burg	33	3991602	701818	75	7	bedding inclined	Conglomerate	Coarse			
Hebberts-burg	34	3991459	701933	0	0	outcrop	Conglomerate	Coarse			
Hebberts-burg	35	3991572	702034	0	0	outcrop	Sandstone	Med-Coarse			
Hebberts-burg	36	3991157	702104	0	0	float	Sandstone	Medium			
Hebberts-burg	37	3991104	702165	0	0	outcrop	Sandstone	Med-Coarse			
Hebberts-burg	38	3991070	702188	0	0	outcrop	Sandstone				
Hebberts-burg	39	3990926	702197	0	0	float	Sandstone				
Hebberts-burg	40	3990931	701332	0	0	outcrop	Conglomerate				
Hebberts-burg	41	3991028	701339	0	0	float	Conglomerate				
Hebberts-burg	42	3991120	701298	0	0	float	Sandstone	Fine			
Hebberts-burg	43	3991089	701246	0	0		Conglomerate				
Hebberts-burg	44	3991036	701197	0	0		Conglomerate				
Hebberts-burg	45	3990976	701227	0	0		Conglomerate				
Hebberts-burg	46	3990964	701276	0	0		Conglomerate				
Hebberts-burg	47	3990942	701317	39	41	bedding inclined	Conglomerate				
Hebberts-burg	48	3990910	701219	0	0	float	Conglomerate				
Hebberts-burg	49	3991052	701134	0	0	float	Sandstone				
Hebberts-burg	50	3990969	701126	0	0	float	Sandstone	Fine			
Hebberts-burg	51	3990940	701052	0	0	float	Conglomerate				
Hebberts-burg	52	3990989	701025	0	0	float	Sandstone	Fine			

QUAD	STATION	UTM Northing	UTM Easting	STRIKE	INCLINE	TYPE	LITHOLOGY 1	GRAIN SIZE	LITHOLOGY 2	GRAIN SIZE 2	MODIFIER
Hebberts-burg	53	3990984	700871	58	13	bedding inclined	Conglomerate				
Hebberts-burg	54	3990647	700870	0	0	outcrop	Conglomerate				
Hebberts-burg	55	3990966	701412	0	0						
Hebberts-burg	56	3991020	701397	0	0						
Hebberts-burg	57	3991122	701318	0	0						
Hebberts-burg	58	3991200	701312	0	0						
Hebberts-burg	59	3991365	701327	0	0						
Hebberts-burg	60	3991514	701367	0	0						
Hebberts-burg	61	3991559	701371	0	0						
Hebberts-burg	62	3991581	701380	0	0						
Hebberts-burg	63	3991597	701391	57	90	bedding vertical					
Hebberts-burg	64	3991632	701399	0	0						
Hebberts-burg	65	3991688	701409	0	0						
Hebberts-burg	66	3991775	701382	0	0						
Hebberts-burg	67	3992253	700979	0	0						
Hebberts-burg	68	3992389	700726	0	0						
Hebberts-burg	69	3992488	700645	0	0						
Hebberts-burg	70	3992471	700368	0	0						
Hebberts-burg	71	3992210	700046	0	0						
Hebberts-burg	72	3992211	699756	0	0						
Hebberts-burg	73	3992276	699583	0	0						
Hebberts-burg	74	3992410	699524	0	0						
Hebberts-burg	75	3992397	699337	0	0						
Hebberts-burg	76	3992503	699244	0	0						
Hebberts-burg	77	3992491	699094	0	0						
Hebberts-burg	78	3992493	698961	0	0						
Hebberts-burg	79	3992490	698922	0	0						
Hebberts-burg	80	3992502	698879	0	0						
Hebberts-burg	81	3992551	698844	0	0						
Hebberts-burg	82	3992483	698758	0	0						
Hebberts-burg	83	3992588	698787	0	0						
Hebberts-burg	84	3992580	698676	0	0						
Hebberts-burg	85	3990773	701274	0	0						

QUAD	STATION	UTM Northing	UTM Easting	STRIKE	INCLINE	TYPE	LITHOLOGY 1	GRAIN SIZE	LITHOLOGY 2	GRAIN SIZE 2	MODIFIER
Hebberts-burg	86	3990638	701218	86	9	bedding inclined					
Hebberts-burg	87	3990543	701190	0	0						
Hebberts-burg	88	3990514	701174	0	0						
Hebberts-burg	89	3990428	701133	0	0						
Hebberts-burg	90	3990394	701090	0	0						
Hebberts-burg	91	3990252	700851	0	0						
Hebberts-burg	92	3990194	700713	0	0						
Hebberts-burg	93	3990028	700426	0	0						
Hebberts-burg	94	3989855	700146	0	0						
Hebberts-burg	95	3992589	698664	0	0	outcrop	Conglomerate				
Hebberts-burg	96	3992700	698575	226	6	bedding inclined	Conglomerate				
Hebberts-burg	97	3992677	698625	276	27	bedding inclined	Conglomerate		Shale		
Hebberts-burg	98	3992689	698758	0	0	outcrop	Conglomerate				
Hebberts-burg	99	3992748	698781	159	8	bedding inclined	Conglomerate				
Hebberts-burg	100	3993087	698508	149	4	bedding inclined	Conglomerate				
Hebberts-burg	101	3994120	700270	0	0	float	Shale				
Hebberts-burg	102	3993987	697770	0	0	outcrop	Conglomerate				
Hebberts-burg	103	3994127	697696	0	0	float	Shale				
Hebberts-burg	104	3994140	697519	0	0	float	Siltstone				
Hebberts-burg	105	3994146	697413	0	0		Conglomerate				
Hebberts-burg	106	3994233	697201	320	6	bedding inclined	Conglomerate				
Hebberts-burg	107	3994272	696704	0	0	outcrop	Conglomerate				
Hebberts-burg	108	3994290	696418	0	0	outcrop	Conglomerate				
Hebberts-burg	109	3993997	696012	0	0		Shale				
Hebberts-burg	110	3993784	695625	0	0	float	Sandstone				
Hebberts-burg	111	3993746	695597	0	0		Sandstone		Shale		
Hebberts-burg	112	3993634	695439	0	0		Shale		Sandstone	Fine	
Hebberts-burg	113	3993211	695132	0	0	outcrop	Sandstone				
Hebberts-burg	114	3992975	694905	0	0	outcrop	Sandstone	Fine			
Hebberts-burg	115	3992935	694882	0	0		Sandstone		Shale		
Hebberts-burg	116	3992247	693849	0	0	outcrop	Conglomerate				
Hebberts-burg	117	3992055	693547	0	0	outcrop	Conglomerate				
Hebberts-burg	118	3992050	693501	160	7	bedding inclined	Siltstone				

QUAD	STATION	UTM Northing	UTM Easting	STRIKE	INCLINE	TYPE	LITHOLOGY 1	GRAIN SIZE	LITHOLOGY 2	GRAIN SIZE 2	MODIFIER
Hebberts-burg	119	3992036	693456	0	0		Conglomerate				
Hebberts-burg	120	3992021	693431	0	0		Sandstone				
Hebberts-burg	121	3991998	693397	0	0	float	Conglomerate				
Hebberts-burg	122	3991982	693345	0	0	outcrop	Shale				
Hebberts-burg	123	3991888	693029	213	9	bedding inclined	Sandstone				
Hebberts-burg	124	3992516	691455	0	0	outcrop	Sandstone				
Hebberts-burg	125	3992497	691482	0	0		Sandstone				
Hebberts-burg	126	3992417	691675	0	0		Sandstone				
Hebberts-burg	127	3992424	691804	0	0		Sandstone				
Hebberts-burg	128	3992448	692066	0	0	outcrop	Sandstone				
Hebberts-burg	129	3992410	692228	0	0	float	Shale				
Hebberts-burg	130	3992361	692409	0	0		Sandstone		Shale		
Hebberts-burg	131	3992357	692531	0	0		Sandstone		Shale		
Hebberts-burg	132	3992360	692556	314	1	bedding inclined	Sandstone				
Hebberts-burg	133	3992335	692676	98	4	bedding inclined	Sandstone				
Hebberts-burg	134	3991905	692876	121	10	bedding inclined	Sandstone		Shale		
Hebberts-burg	135	3991940	693071	72	2	bedding inclined	Sandstone				
Hebberts-burg	136	3991868	694905	0	0	float	Sandstone				
Hebberts-burg	137	3991824	694861	0	0	float	Sandstone				
Hebberts-burg	138	3991727	694828	26	57	bedding inclined	Sandstone				
Hebberts-burg	139	3991766	694893	14	34	bedding inclined	Conglomerate				
Hebberts-burg	140	3991783	694991	0	0		Sandstone		Shale		
Hebberts-burg	141	3991701	695022	0	0		Shale				
Hebberts-burg	142	3991657	695027	62	34	bedding inclined	Shale		Sandstone	Fine	
Hebberts-burg	143	3991647	695063	51	37	bedding inclined	Shale				
Hebberts-burg	144	3991724	695139	0	0		Sandstone	Fine			
Hebberts-burg	145	3991747	695161	44	36	bedding inclined	Siltstone				
Hebberts-burg	146	3992349	697662	0	0		Sandstone		Shale		
Hebberts-burg	147	3992433	697677	58	13	bedding inclined	Sandstone				
Hebberts-burg	148	3992502	697681	39	10	bedding inclined	Conglomerate				
Hebberts-burg	149	3992674	697672	0	0	float	Conglomerate				
Hebberts-burg	150	3992725	697690	0	0		Shale				
Hebberts-burg	151	3992774	697704	0	0	float	Sandstone				

QUAD	STATION	UTM Northing	UTM Easting	STRIKE	INCLINE	TYPE	LITHOLOGY 1	GRAIN SIZE	LITHOLOGY 2	GRAIN SIZE 2	MODIFIER
Hebberts-burg	152	3992788	697542	0	0		Shale				
Hebberts-burg	153	3992767	697485	0	0	float	Sandstone				
Hebberts-burg	154	3992866	697090	0	0		Sandstone	Fine			
Hebberts-burg	155	3992738	696813	0	0	float	Shale				
Hebberts-burg	156	3992729	696802	90	24	bedding inclined	Sandstone				
Hebberts-burg	157	3992642	696450	0	0		Sandstone				
Hebberts-burg	158	3992635	696435	89	34	bedding inclined	Sandstone				
Hebberts-burg	159	3992632	696363	69	41	bedding inclined	Sandstone				
Hebberts-burg	160	3992440	696163	84	30	bedding inclined	Conglomerate				
Hebberts-burg	161	3992247	695823	0	0	outcrop	Conglomerate				
Hebberts-burg	162	3992145	695652	0	0		Conglomerate				
Hebberts-burg	163	3992081	695536	48	35	bedding inclined	Conglomerate				
Hebberts-burg	164	3992020	695446	46	36	bedding inclined	Conglomerate				
Hebberts-burg	165	3993188	698357	0	0	float	Sandstone				
Hebberts-burg	166	3993181	698352	29	5	bedding inclined	Conglomerate				
Hebberts-burg	167	3993188	697897	0	0	float	Sandstone				
Hebberts-burg	168	3993149	697611	0	0	float	Sandstone				
Hebberts-burg	169	3993029	697478	104	21	bedding inclined	Shale				
Hebberts-burg	170	3992974	697402	0	0	outcrop	Shale				
Hebberts-burg	171	3992799	697371	71	39	bedding inclined	Shale				
Hebberts-burg	172	3992769	697429	0	0	float	Shale				
Hebberts-burg	173	3994431	697841	0	0	float	Sandstone	Fine			
Hebberts-burg	174	3994550	697828	0	0	float	Sandstone	Fine			
Hebberts-burg	175	3994614	697810	0	0	outcrop	Sandstone				
Hebberts-burg	176	3994789	697923	0	0	outcrop	Sandstone				
Hebberts-burg	177	3994948	697922	0	0	float	Sandstone				
Hebberts-burg	178	3993201	695059	0	0	float	Sandstone				
Hebberts-burg	179	3993740	695264	0	0	float	Shale				
Hebberts-burg	180	3993778	695303	0	0	float	Sandstone				
Hebberts-burg	181	3994288	695696	0	0	float	Sandstone				
Hebberts-burg	182	3994308	695711	21	4	bedding inclined	Sandstone				
Hebberts-burg	183	3994751	695754	0	0		Shale				
Hebberts-burg	184	3994767	695772	74	2	bedding inclined	Sandstone				

QUAD	STATION	UTM Northing	UTM Easting	STRIKE	INCLINE	TYPE	LITHOLOGY 1	GRAIN SIZE	LITHOLOGY 2	GRAIN SIZE 2	MODIFIER
Hebberts-burg	185	3995224	696156	0	0	outcrop	Sandstone				
Hebberts-burg	186	3995304	696200	0	0	float	Shale				
Hebberts-burg	187	3991684	695279	0	0	float	Sandstone				
Hebberts-burg	188	3991475	695528	0	0		Sandstone		Shale		
Hebberts-burg	189	3991454	695609	0	0	bedding horizontal	Sandstone				
Hebberts-burg	190	3991225	695825	0	0		Sandstone				
Hebberts-burg	191	3991330	696944	0	0	outcrop	Sandstone				
Hebberts-burg	192	3991366	697057	0	0	outcrop	Sandstone				
Hebberts-burg	193	3991348	697439	0	0	float	Shale				
Hebberts-burg	194	3991352	697520	0	0	outcrop	Sandstone				
Hebberts-burg	195	3991367	697605	0	0	outcrop	Sandstone				
Hebberts-burg	196	3991774	698123	39	11	bedding inclined	Sandstone				
Hebberts-burg	197	3993847	691689	0	0	float	Sandstone				
Hebberts-burg	198	3993896	691648	0	0	outcrop	Sandstone				
Hebberts-burg	199	3993988	692120	0	0	float	Shale				
Hebberts-burg	200	3994711	693433	0	0	outcrop	Sandstone				
Hebberts-burg	201	3994528	693614	0	0		Sandstone		Shale		
Hebberts-burg	202	3994181	693659	0	0	float	Sandstone				
Hebberts-burg	203	3994087	693595	0	0	float	Shale				
Hebberts-burg	204	3993945	693223	0	0	outcrop	Sandstone				
Hebberts-burg	205	3993865	693182	0	0		Sandstone				
Hebberts-burg	206	3993782	693163	0	0	bedding horizontal	Conglomerate				
Hebberts-burg	207	3994640	693724	0	0	float	Shale				
Hebberts-burg	208	3994825	693813	0	0	float	Shale				
Hebberts-burg	209	3994906	694216	0	0	float	Sandstone	Fine			
Hebberts-burg	210	3994815	694647	0	0	float	Sandstone	Fine			
Hebberts-burg	211	3994886	694787	0	0	float	Shale				
Hebberts-burg	212	3986648	692840	0	0	bedding horizontal	Conglomerate				
Hebberts-burg	213	3986758	693241	24	9	bedding inclined	Sandstone				
Hebberts-burg	214	3986850	693353	41	19	bedding inclined	Sandstone				
Hebberts-burg	215	3986864	693354	46	16	bedding inclined	Sandstone				
Hebberts-burg	216	3986847	693027	334	4	bedding inclined	Sandstone				
Hebberts-burg	217	3986894	693047	280	6	bedding inclined	Sandstone				

QUAD	STATION	UTM Northing	UTM Easting	STRIKE	INCLINE	TYPE	LITHOLOGY 1	GRAIN SIZE	LITHOLOGY 2	GRAIN SIZE 2	MODIFIER
Hebberts-burg	218	3987027	693053	51	14	bedding inclined	Sandstone	Fine			
Hebberts-burg	219	3987051	693017	0	0	outcrop	Conglomerate	Med-Coarse			
Hebberts-burg	220	3987104	692899	273	14	bedding inclined	Sandstone	Fine			
Hebberts-burg	221	3987142	692893	79	11	bedding inclined	Shale				
Hebberts-burg	222	3987335	692886	0	0		Other				
Hebberts-burg	223	3987430	692894	0	0		Sandstone		Shale		
Hebberts-burg	224	3987336	692789	98	11	bedding inclined	Shale				
Hebberts-burg	225	3987456	692869	38	17	bedding inclined	Shale				
Hebberts-burg	226	3987520	692858	40	70	bedding inclined	Shale				
Hebberts-burg	227	3987677	692718	0	0		Siltstone				
Hebberts-burg	228	3987699	692681	58	4	bedding inclined	Shale				
Hebberts-burg	229	3987554	692635	150	10	bedding inclined	Sandstone	Fine			
Hebberts-burg	230	3987581	692616	148	19	bedding inclined	Sandstone				
Hebberts-burg	231	3987659	692596	0	0		Sandstone				
Hebberts-burg	232	3987726	692652	182	15	bedding inclined	Sandstone		Shale		
Hebberts-burg	233	3987746	692634	4	8	bedding inclined	Shale				
Hebberts-burg	234	3989377	693742	0	0	float	Sandstone				
Hebberts-burg	235	3989483	693691	276	7	bedding inclined	Shale				
Hebberts-burg	236	3989488	693462	0	0	float	Sandstone				
Hebberts-burg	237	3989336	693237	0	0	bedding horizontal	Conglomerate				X-Bedded
Hebberts-burg	238	3989119	693079	257	2	bedding inclined	Conglomerate				
Hebberts-burg	239	3989032	693019	0	0	float	Shale				
Hebberts-burg	240	3988985	692947	0	0	bedding horizontal	Conglomerate				
Hebberts-burg	241	3988973	692904	131	1	bedding inclined	Conglomerate				
Hebberts-burg	242	3988895	692848	0	0	bedding horizontal	Conglomerate				
Hebberts-burg	243	3988796	692788	108	2	bedding inclined	Conglomerate				
Hebberts-burg	244	3988707	692817	44	6	bedding inclined	Conglomerate				
Hebberts-burg	245	3988610	692968	206	3	bedding inclined	Conglomerate				
Hebberts-burg	246	3988247	693320	208	3	bedding inclined	Conglomerate				
Hebberts-burg	247	3988452	693426	0	0	outcrop	Conglomerate				
Hebberts-burg	248	3988486	693411	64	2	bedding inclined	Conglomerate				
Hebberts-burg	249	3987782	692174	0	0	bedding horizontal	Sandstone				
Hebberts-burg	250	3988687	693343	0	0		Sandstone				

QUAD	STATION	UTM Northing	UTM Easting	STRIKE	INCLINE	TYPE	LITHOLOGY 1	GRAIN SIZE	LITHOLOGY 2	GRAIN SIZE 2	MODIFIER
Hebberts-burg	251	3989160	693580	0	0	bedding horizontal	Sandstone				
Hebberts-burg	252	3988253	692280	191	39	bedding inclined	Sandstone	Med-Fine			
Hebberts-burg	253	3988458	692351	0	0	float	Sandstone	Fine			
Hebberts-burg	254	3988389	692521	0	0	bedding horizontal	Sandstone	Fine			
Hebberts-burg	255	3988111	692592	56	25	bedding inclined	Sandstone	Fine			
Hebberts-burg	256	3988117	692664	56	12	bedding inclined	Sandstone	Fine			
Hebberts-burg	257	3988080	692516	76	52	bedding inclined	Sandstone	Fine			
Hebberts-burg	258	3988083	692533	0	0		Breccia				
Hebberts-burg	259	3988118	692371	0	0	float	Sandstone	Med-Fine			
Hebberts-burg	260	3987918	692401	0	0	float	Sandstone	Med-Coarse			
Hebberts-burg	261	3987819	692639	0	0	outcrop		Med-Fine			
Hebberts-burg	262	3987791	692458	0	0		Sandstone	Medium			
Hebberts-burg	263	3987877	692484	235	57	bedding inclined	Sandstone	Fine			
Hebberts-burg	264	3987924	692485	334	22	bedding inclined	Sandstone				
Hebberts-burg	265	3988789	692323	0	0		Shale				
Hebberts-burg	266	3988883	692341	345	1	bedding inclined	Shale				
Hebberts-burg	267	3988805	692364	0	0	float	Sandstone				
Hebberts-burg	268	3988543	692111	0	0		Shale				
Hebberts-burg	269	3988784	691974	0	0	bedding horizontal	Shale				
Hebberts-burg	270	3987996	692928	19	4	bedding inclined	Conglomerate				
Hebberts-burg	271	3988960	691584	0	0	float	Sandstone	Fine			
Hebberts-burg	272	3988745	691774	0	0	float	Sandstone	Fine			
Hebberts-burg	273	3988687	691814	0	0	float	Sandstone	Fine			
Hebberts-burg	274	3988599	691925	0	0	float	Conglomerate				
Hebberts-burg	275	3988513	691935	304	9	bedding inclined	Conglomerate				
Hebberts-burg	276	3988652	691771	0	0	float	Shale				
Hebberts-burg	277	3988714	691624	344	16	bedding inclined	Sandstone				
Hebberts-burg	278	3988757	691555	278	18	bedding inclined	Sandstone				
Hebberts-burg	279	3989023	691996	0	0		Shale				
Hebberts-burg	280	3988861	692015	0	0	float	Sandstone	Fine			
Hebberts-burg	281	3989179	692283	235	64	bedding inclined	Sandstone		Shale		
Hebberts-burg	282	3989184	692282	216	8	bedding inclined	Sandstone		Shale		
Hebberts-burg	283	3989189	692286	44	32	bedding inclined	Sandstone		Shale		

QUAD	STATION	UTM Northing	UTM Easting	STRIKE	INCLINE	TYPE	LITHOLOGY 1	GRAIN SIZE	LITHOLOGY 2	GRAIN SIZE 2	MODIFIER
Hebberts-burg	284	3989200	692288	152	18	bedding inclined	Sandstone		Shale		
Hebberts-burg	285	3989268	692512	252	2	bedding inclined	Shale				
Hebberts-burg	286	3989304	692578	0	0	float	Sandstone				
Hebberts-burg	287	3989275	692555	69	10	bedding inclined	Sandstone				
Hebberts-burg	288	3989257	692446	0	0	float	Sandstone				
Hebberts-burg	289	3989236	692190	26	6	bedding inclined	Sandstone				
Hebberts-burg	290	3989224	692181	0	0	float	Shale				
Hebberts-burg	291	3989346	692163	0	0	float	Shale				
Hebberts-burg	292	3989753	699806	36	4	bedding inclined	Sandstone				
Hebberts-burg	293	3989649	699678	0	0	bedding horizontal	Sandstone				
Hebberts-burg	294	3989527	699409	0	0	outcrop	Sandstone				
Hebberts-burg	295	3989493	699370	0	0	float	Sandstone				
Hebberts-burg	296	3989570	699341	76	18	bedding inclined	Sandstone				
Hebberts-burg	297	3989659	699245	0	0	float	Conglomerate	Coarse			
Hebberts-burg	298	3989723	699236	46	3	bedding inclined	Conglomerate	Medium			
Hebberts-burg	299	3989783	699201	328	21	bedding inclined	Conglomerate	Medium			
Hebberts-burg	300	3990113	697219	0	0	bedding horizontal	Conglomerate				
Hebberts-burg	301	3989200	697388	0	0						
Hebberts-burg	302	3989245	697445	84	90	bedding vertical	Conglomerate				
Hebberts-burg	303	3989887	697357	160	6	bedding inclined	Sandstone	Medium			
Hebberts-burg	304	3989227	699307	28	2	bedding inclined	Conglomerate				
Hebberts-burg	305	3988782	699050	0	0	outcrop	Shale				
Hebberts-burg	306	3988380	699075	0	0	float	Sandstone	Fine			
Hebberts-burg	307	3988060	698772	0	0	outcrop	Sandstone				
Hebberts-burg	308	3987972	698725	54	12	bedding inclined	Sandstone				
Hebberts-burg	309	3987809	698487	62	9	bedding inclined	Sandstone				
Hebberts-burg	310	3987579	698487	0	0	outcrop	Sandstone				
Hebberts-burg	311	3989095	691912	0	0	float	Sandstone	Fine			
Hebberts-burg	313	3989797	692497	226	42	bedding inclined	Shale				
Hebberts-burg	314	3989754	692460	54	35	bedding inclined	Shale		Sandstone		
Hebberts-burg	315	3989682	692295	0	0	bedding horizontal	Sandstone				
Hebberts-burg	316	3989772	692406	46	4	bedding inclined	Sandstone				
Hebberts-burg	317	3989743	692413	24	12	bedding inclined	Sandstone				

QUAD	STATION	UTM Northing	UTM Easting	STRIKE	INCLINE	TYPE	LITHOLOGY 1	GRAIN SIZE	LITHOLOGY 2	GRAIN SIZE 2	MODIFIER
Hebberts-burg	318	3989623	692260	0	0	float	Shale				
Hebberts-burg	319	3989532	692171	54	36	bedding inclined	Shale				
Hebberts-burg	320	3989374	691807	38	9	bedding inclined	Sandstone				
Hebberts-burg	321	3989338	691844	36	8	bedding inclined	Sandstone				
Hebberts-burg	322	3989203	691819	48	4	bedding inclined	Sandstone				
Hebberts-burg	323	3989224	691780	96	5	bedding inclined	Sandstone				
Hebberts-burg	324	3989242	691774	52	12	bedding inclined	Sandstone				
Hebberts-burg	325	3989279	691763	48	12	bedding inclined	Sandstone				
Hebberts-burg	326	3989181	691645	64	19	bedding inclined	Sandstone				
Hebberts-burg	327	3989599	692155	46	9	bedding inclined	Sandstone				
Hebberts-burg	328	3989660	692223	47	14	bedding inclined	Sandstone				
Hebberts-burg	329	3989584	692094	41	16		Sandstone				
Hebberts-burg	330	3989423	692256	0	0	float	Shale				
Hebberts-burg	331	3989663	692648	0	0	float	Shale				
Hebberts-burg	332	3989696	692657	0	0		Shale				
Hebberts-burg	333	3989730	692653	0	0		Shale				
Hebberts-burg	334	3989802	692616	0	0	float	Sandstone				
Hebberts-burg	335	3989434	692618	0	0						
Hebberts-burg	336	3989434	692639	36	31	bedding inclined	Sandstone		Shale		
Hebberts-burg	337	3989439	692655	109	21	bedding inclined	Sandstone				
Hebberts-burg	338	3989459	692706	28	16	bedding inclined	Sandstone	Coarse			
Hebberts-burg	339	3989875	693227	344	16	bedding inclined	Sandstone				
Hebberts-burg	340	3987412	691829	0	0	bedding horizontal	Sandstone				
Hebberts-burg	341	3987371	691816	92	9	bedding inclined	Sandstone				
Hebberts-burg	342	3987344	691905	71	16	bedding inclined	Sandstone				
Hebberts-burg	343	3987293	691945	0	0	outcrop	Sandstone				
Hebberts-burg	344	3987238	691905	0	0	bedding horizontal	Sandstone				
Hebberts-burg	345	3987289	691825	0	0	bedding horizontal	Sandstone				
Hebberts-burg	346	3986952	691678	236	2	bedding inclined	Sandstone				
Hebberts-burg	347	3987100	692073	334	6	bedding inclined	Sandstone				
Hebberts-burg	348	3987189	692087	11	11	bedding inclined	Sandstone				
Hebberts-burg	349	3987276	692077	8	9	bedding inclined	Sandstone				
Hebberts-burg	350	3987504	691994	93	4	bedding inclined	Sandstone				

QUAD	STATION	UTM Northing	UTM Easting	STRIKE	INCLINE	TYPE	LITHOLOGY 1	GRAIN SIZE	LITHOLOGY 2	GRAIN SIZE 2	MODIFIER
Hebberts-burg	351	3987260	692591	3	4	bedding inclined	Sandstone				
Hebberts-burg	352	3987290	692559	0	0	bedding horizontal	Sandstone				
Hebberts-burg	353	3987170	692410	0	0	outcrop	Sandstone				
Hebberts-burg	354	3986997	691562	0	0	outcrop	Sandstone				
Hebberts-burg	355	3987937	693070	0	0	bedding horizontal	Sandstone				
Hebberts-burg	356	3987899	693046	0	0		Shale				
Hebberts-burg	357	3987898	693171	0	0	outcrop	Shale				
Hebberts-burg	358	3987956	693494	0	0	bedding horizontal	Shale				
Hebberts-burg	359	3988001	693470	0	0	bedding horizontal	Sandstone				
Hebberts-burg	360	3988014	693567	89	8	bedding inclined	Sandstone				
Hebberts-burg	361	3988108	693880	204	14	bedding inclined	Sandstone				
Hebberts-burg	362	3988103	693899	84	6	bedding inclined	Sandstone				
Hebberts-burg	363	3987969	693535	0	0	bedding horizontal	Sandstone				
Hebberts-burg	364	3988341	693786	169	7	bedding inclined	Conglomerate				
Hebberts-burg	365	3989153	693638	0	0	bedding horizontal	Conglomerate				
Hebberts-burg	366	3989201	693820	0	0		Conglomerate				
Hebberts-burg	367	3989218	693970	0	0		Conglomerate				
Hebberts-burg	368	3989184	694213	0	0	float	Sandstone				
Hebberts-burg	369	3989077	694139	0	0	outcrop	Shale				
Hebberts-burg	370	3988712	694326	36	6	bedding inclined	Sandstone				
Hebberts-burg	371	3988672	694379	0	0	float	Sandstone				
Hebberts-burg	372	3988621	694390	326	8	bedding inclined	Sandstone				
Hebberts-burg	373	3988396	694454	226	6	bedding inclined	Sandstone				
Hebberts-burg	374	3988462	694492	0	0	outcrop	Sandstone				
Hebberts-burg	375	3988672	694562	71	8	bedding inclined	Sandstone				
Hebberts-burg	376	3989080	694560	0	0	float	Sandstone				
Hebberts-burg	377	3989524	694438	251	59	bedding inclined	Sandstone				
Hebberts-burg	378	3989517	694386	270	56	bedding inclined	Sandstone				
Hebberts-burg	379	3989215	693789	118	10	bedding inclined	Conglomerate				
Hebberts-burg	380	3987239	694698	221	15	bedding inclined	Sandstone	Fine			
Hebberts-burg	381	3987535	695078	204	2	bedding inclined	Sandstone				
Hebberts-burg	382	3987624	695148	252	7	bedding inclined	Sandstone				
Hebberts-burg	383	3987811	694971	0	0	outcrop	Sandstone				

QUAD	STATION	UTM Northing	UTM Easting	STRIKE	INCLINE	TYPE	LITHOLOGY 1	GRAIN SIZE	LITHOLOGY 2	GRAIN SIZE 2	MODIFIER
Hebberts-burg	384	3987970	694988	0	0	outcrop	Sandstone				
Hebberts-burg	385	3987877	694959	271	16	bedding inclined	Sandstone				
Hebberts-burg	386	3987731	694952	224	9	bedding inclined	Sandstone				
Hebberts-burg	387	3987678	695148	296	14	bedding inclined	Sandstone				
Hebberts-burg	388	3989428	692698	51	24	bedding inclined	Sandstone				
Hebberts-burg	388	3989428	692698	300	79	joint inclined	Sandstone				
Hebberts-burg	388	3989428	692698	333	90	joint vertical	Sandstone				
Hebberts-burg	389	3989377	692743	47	25	bedding inclined	Conglomerate				
Hebberts-burg	390	3989383	692745	0	0	float	Shale				
Hebberts-burg	391	3989343	692750	46	4	bedding inclined	Sandstone	Fine			
Hebberts-burg	392	3989354	692853	0	0		Shale				
Hebberts-burg	393	3989342	692820	349	11	bedding inclined	Sandstone				
Hebberts-burg	394	3989320	692815	0	0	float	Conglomerate				
Hebberts-burg	395	3989352	692889	24	31	bedding inclined	Sandstone				
Hebberts-burg	396	3989264	692874	19	22	bedding inclined	Conglomerate				
Hebberts-burg	397	3989279	692944	14	16	bedding inclined	Conglomerate				
Hebberts-burg	398	3989406	693052	72	23	bedding inclined	Conglomerate				
Hebberts-burg	399	3989386	693116	0	0	bedding horizontal	Conglomerate				
Hebberts-burg	400	3989404	693118	0	0		Conglomerate				
Hebberts-burg	401	3989510	693103	234	38	bedding inclined	Conglomerate				
Hebberts-burg	402	3987661	693678	0	0	outcrop	Sandstone				
Hebberts-burg	403	3987907	693753	0	0	float	Sandstone				
Hebberts-burg	404	3987987	693655	0	0						
Hebberts-burg	405	3988081	693773	0	0	float	Shale				
Hebberts-burg	406	3988521	693867	234	28	bedding inclined	Sandstone				
Hebberts-burg	406	3988521	693867	31	0	fold hinge	Sandstone				
Hebberts-burg	407	3988456	693987	239	69	bedding inclined	Sandstone				
Hebberts-burg	408	3988403	694131	224	69	bedding inclined	Sandstone				
Hebberts-burg	409	3988426	694092	0	0						
Hebberts-burg	410	3988388	694185	46	78	bedding inclined	Sandstone				
Hebberts-burg	411	3988444	694196	238	41	bedding inclined	Sandstone				
Hebberts-burg	412	3988460	694177	0	0						
Hebberts-burg	413	3988523	694150	238	53	bedding inclined	Sandstone				

QUAD	STATION	UTM Northing	UTM Easting	STRIKE	INCLINE	TYPE	LITHOLOGY 1	GRAIN SIZE	LITHOLOGY 2	GRAIN SIZE 2	MODIFIER
Hebberts-burg	414	3988494	693973	309	6	bedding inclined	Sandstone				
Hebberts-burg	415	3988732	694204	246	6	bedding inclined	Sandstone				
Hebberts-burg	416	3988958	694147	157	4	bedding inclined	Sandstone				
Hebberts-burg	417	3989033	694079	0	0	outcrop	Sandstone				
Hebberts-burg	418	3992309	695093	0	0	float	Shale				
Hebberts-burg	419	3992246	695170	0	0		Shale		Sandstone	Fine	
Hebberts-burg	420	3992429	695744	0	0	float	Shale				
Hebberts-burg	421	3992475	695835	0	0		Sandstone				
Hebberts-burg	422	3992503	695941	0	0		Breccia				
Hebberts-burg	423	3992880	696240	0	0	float	Conglomerate				
Hebberts-burg	424	3992745	696354	0	0		Conglomerate				
Hebberts-burg	425	3992795	696482	0	0		Conglomerate				
Hebberts-burg	426	3992815	696497	56	24	bedding inclined	Conglomerate				
Hebberts-burg	427	3992884	696547	24	40	bedding inclined	Conglomerate				
Hebberts-burg	428	3992946	696621	0	0		Sandstone	Fine			
Hebberts-burg	429	3993009	696660	0	0		Shale				
Hebberts-burg	430	3993221	696703	0	0		Shale				
Hebberts-burg	431	3992530	696486	242	71	bedding inclined	Sandstone				
Hebberts-burg	432	3992461	696468	89	67	bedding inclined	Sandstone				
Hebberts-burg	433	3992428	696384	74	46	bedding inclined	Conglomerate				
Hebberts-burg	434	3992397	696337	46	38	bedding inclined	Conglomerate				
Hebberts-burg	435	3992362	696286	70	29	bedding inclined	Conglomerate				
Hebberts-burg	436	3992320	696215	59	42	bedding inclined	Conglomerate				
Hebberts-burg	437	3992320	696160	56	47	bedding inclined	Conglomerate				
Hebberts-burg	438	3992399	696117	41	30	bedding inclined	Conglomerate				
Hebberts-burg	439	3997036	692438	28	10	bedding inclined	Sandstone	Med-Coarse			
Hebberts-burg	440	3996980	693287	0	0	bedding horizontal	Sandstone	Med-Coarse			
Hebberts-burg	441	3996988	693558	0	0	outcrop	Shale				
Hebberts-burg	442	3998036	692233	0	0	outcrop	Shale				
Hebberts-burg	443	3999132	691923	0	0	outcrop	Sandstone	Med-Coarse			
Hebberts-burg	444	3999260	691904	0	0						
Hebberts-burg	445	3999279	691894	0	0						
Hebberts-burg	446	3996941	693814	0	0	bedding horizontal	Sandstone	Med-Fine			

QUAD	STATION	UTM Northing	UTM Easting	STRIKE	INCLINE	TYPE	LITHOLOGY 1	GRAIN SIZE	LITHOLOGY 2	GRAIN SIZE 2	MODIFIER
Hebberts-burg	447	3997605	695383	0	0	outcrop	Sandstone	Med-Coarse			
Hebberts-burg	448	3997833	696201	0	0	outcrop	Sandstone	Med-Coarse			
Hebberts-burg	449	3997847	696249	0	0	outcrop	Shale				
Hebberts-burg	450	3997887	696886	0	0	bedding horizontal	Sandstone	Med-Coarse			
Hebberts-burg	451	3997803	697291	0	0	outcrop	Shale				
Hebberts-burg	452	3997249	697010	0	0	bedding horizontal	Sandstone	Med-Coarse			
Hebberts-burg	453	3996658	697206	0	0	float	Sandstone	Med-Coarse			
Hebberts-burg	454	3997610	698037	318	3	bedding inclined	Sandstone	Med-Coarse			
Hebberts-burg	455	3997970	698241	22	8	bedding inclined	Sandstone	Med-Fine			
Hebberts-burg	456	3996843	699573	0	0	bedding horizontal	Shale				
Hebberts-burg	457	3997339	700287	0	0	outcrop	Sandstone	Med-Coarse			
Hebberts-burg	458	3998390	702198	300	2	bedding inclined	Sandstone	Med-Coarse			
Hebberts-burg	459	3998657	702292	0	0	bedding horizontal	Sandstone	Med-Coarse			
Hebberts-burg	460	3998763	701922	0	0	outcrop	Sandstone	Med-Coarse			
Hebberts-burg	461	3991709	695298	0	0	outcrop	Conglomerate				
Hebberts-burg	462	3991665	695505	11	34	bedding inclined	Conglomerate				
Hebberts-burg	463	3991651	695534	44	61	bedding inclined	Conglomerate				
Hebberts-burg	464	3991822	695628	0	0		Conglomerate				
Hebberts-burg	465	3991896	695605	56	19	bedding inclined	Conglomerate				
Hebberts-burg	466	3991912	695796	44	39	bedding inclined	Conglomerate				
Hebberts-burg	467	3992018	695918	57	34	bedding inclined	Conglomerate				
Hebberts-burg	468	3992112	695995	49	34	bedding inclined	Conglomerate				
Hebberts-burg	469	3992206	696084	46	36	bedding inclined	Conglomerate				
Hebberts-burg	470	3992274	696095	48	30	bedding inclined	Conglomerate				
Hebberts-burg	471	3992377	696080	59	38	bedding inclined	Conglomerate				
Hebberts-burg	472	3992246	696192	46	49	bedding inclined	Conglomerate				
Hebberts-burg	473	3992042	696344	62	56	bedding inclined	Conglomerate				
Hebberts-burg	474	3991202	695945	0	0		Sandstone				
Hebberts-burg	475	3990060	693216	54	44	bedding inclined	Sandstone	Med-Coarse			
Hebberts-burg	476	3990077	692962	0	0	float	Sandstone	Med-Fine			
Hebberts-burg	477	3989930	692920	134	4	bedding inclined	Sandstone	Medium			
Hebberts-burg	478	3989771	692752	139	5	bedding inclined	Shale				
Hebberts-burg	479	3990518	693052	89	6	bedding inclined	Shale				

QUAD	STATION	UTM Northing	UTM Easting	STRIKE	INCLINE	TYPE	LITHOLOGY 1	GRAIN SIZE	LITHOLOGY 2	GRAIN SIZE 2	MODIFIER
Hebberts-burg	480	3990680	692989	79	6	bedding inclined	Sandstone	Med-Coarse			
Hebberts-burg	481	3990493	692298	7	35	bedding inclined	Sandstone	Med-Fine			
Hebberts-burg	482	3990621	692386	31	24	bedding inclined	Sandstone	Med-Coarse			
Hebberts-burg	483	3990671	692176	62	14	bedding inclined	Sandstone	Med-Coarse			
Hebberts-burg	484	3990708	692194	211	34		Sandstone	Med-Fine			
Hebberts-burg	485	3990599	692161	118	21	bedding inclined	Sandstone	Med-Fine			
Hebberts-burg	486	3990559	692149	124	12	bedding inclined	Sandstone				
Hebberts-burg	487	3990316	691891	303	3	bedding inclined	Sandstone	Med-Coarse			
Hebberts-burg	488	3989998	691833	46	4	bedding inclined	Sandstone	Med-Coarse			
Hebberts-burg	489	3989846	691675	0	0	outcrop	Sandstone	Medium			
Hebberts-burg	490	3990258	692010	0	0	outcrop	Sandstone	Med-Coarse			
Hebberts-burg	491	3990595	691724	0	0	bedding horizontal	Sandstone	Med-Coarse			
Hebberts-burg	492	3986322	691635	126	6	bedding inclined	Sandstone	Med-Coarse			
Hebberts-burg	493	3991850	693150	0	0	bedding horizontal	Sandstone				
Hebberts-burg	494	3991842	693150	354	26	bedding inclined	Sandstone				
Hebberts-burg	495	3991830	693166	1	6	bedding inclined	Sandstone				
Hebberts-burg	496	3991776	693193	0	0	float	Conglomerate				
Hebberts-burg	497	3991728	693124	159	9	bedding inclined	Sandstone				
Hebberts-burg	498	3991706	693117	0	0		Sandstone				
Hebberts-burg	499	3991601	693058	0	0		Conglomerate				
Hebberts-burg	500	3991576	693031	0	0		Sandstone				
Hebberts-burg	501	3991684	692998	124	13	bedding inclined	Sandstone				
Hebberts-burg	502	3991682	692970	0	0	float	Conglomerate				
Hebberts-burg	503	3991678	693037	98	11	bedding inclined	Sandstone				
Hebberts-burg	504	3991720	693070	128	6	bedding inclined	Sandstone				
Hebberts-burg	505	3991634	693122	121	18	bedding inclined	Sandstone				
Hebberts-burg	506	3991581	693215	104	9	bedding inclined	Sandstone				
Hebberts-burg	507	3991586	693244	0	0	float	Conglomerate				
Hebberts-burg	508	3991558	693402	0	0	float	Conglomerate				
Hebberts-burg	509	3991540	693444	0	0		Conglomerate				
Hebberts-burg	510	3991602	693564	119	65	bedding inclined	Conglomerate				
Hebberts-burg	511	3991191	695152	0	0		Shale				
Hebberts-burg	512	3991133	695056	0	0		Sandstone				

QUAD	STATION	UTM Northing	UTM Easting	STRIKE	INCLINE	TYPE	LITHOLOGY 1	GRAIN SIZE	LITHOLOGY 2	GRAIN SIZE 2	MODIFIER
Hebberts-burg	513	3991059	695076	59	3	bedding inclined	Sandstone				
Hebberts-burg	514	3991107	694947	117	2	bedding inclined	Sandstone				
Hebberts-burg	515	3991064	694754	0	0		Shale				
Hebberts-burg	516	3991064	694745	179	9	bedding inclined	Shale				
Hebberts-burg	517	3991058	694726	231	41	bedding inclined	Conglomerate				
Hebberts-burg	518	3991252	694710	331	4	bedding inclined	Conglomerate				
Hebberts-burg	519	3991272	694695	39	5	bedding inclined	Conglomerate				
Hebberts-burg	520	3990958	694658	0	0		Conglomerate				
Hebberts-burg	521	3990772	694534	21	71	bedding inclined	Conglomerate				
Hebberts-burg	522	3990806	694655	213	54	bedding inclined	Conglomerate				
Hebberts-burg	523	3990887	694666	74	31	bedding inclined	Conglomerate				
Hebberts-burg	524	3991025	694383	0	0	float	Conglomerate				
Hebberts-burg	525	3991073	694633	130	68	bedding inclined	Conglomerate				
Hebberts-burg	526	3991128	694349	0	0		Sandstone				
Hebberts-burg	527	3991165	694331	0	0		Sandstone				
Hebberts-burg	528	3991317	694152	49	35	bedding inclined	Sandstone	Fine			
Hebberts-burg	529	3991328	694119	0	0		Sandstone				
Hebberts-burg	530	3991402	694016	91	30	bedding inclined	Sandstone	Med-Fine			
Hebberts-burg	531	3991786	693513	0	0	outcrop	Sandstone	Med-Coarse			
Hebberts-burg	532	3991655	693624	319	0	joint inclined	Sandstone	Med-Coarse			
Hebberts-burg	532	3991655	693624	351	0		Sandstone	Med-Coarse			
Hebberts-burg	532	3991655	693624	4	8	bedding inclined	Sandstone	Med-Coarse			
Hebberts-burg	533	3991155	693892	109	30	bedding inclined	Sandstone	Med-Coarse			
Hebberts-burg	534	3991234	693916	0	0	float	Sandstone	Med-Fine			Brecciated
Hebberts-burg	535	3991184	694044	86	34	bedding inclined	Sandstone	Med-Coarse			
Hebberts-burg	536	3991346	694078	0	0	float	Sandstone	Med-Fine			Brecciated
Hebberts-burg	537	3991328	694031	0	0	outcrop	Sed Breccia	Med-Coarse			
Hebberts-burg	538	3991639	693583	24	21	bedding inclined	Sandstone	Medium			
Hebberts-burg	538	3991639	693583	316	0		Sandstone	Medium			
Hebberts-burg	539	3992432	698849	328	56	bedding inclined	Sed Breccia	Med-Coarse			
Hebberts-burg	540	3992423	698881	0	0	outcrop	Sed Breccia	Med-Coarse			
Hebberts-burg	541	3992423	698911	0	0	outcrop	Sed Breccia	Med-Coarse			
Hebberts-burg	542	3992429	698971	288	36	bedding inclined	Sandstone	Med-Coarse			

QUAD	STATION	UTM Northing	UTM Easting	STRIKE	INCLINE	TYPE	LITHOLOGY 1	GRAIN SIZE	LITHOLOGY 2	GRAIN SIZE 2	MODIFIER
Hebberts-burg	543	3992414	698993	223	4	bedding inclined	Sandstone	Med-Coarse			
Hebberts-burg	544	3992432	699034	296	32	bedding inclined	Sandstone	Med-Coarse			
Hebberts-burg	545	3992510	699114	0	0	bedding horizontal	Sandstone	Med-Coarse			
Hebberts-burg	546	3990772	701510	0	0	float	Shale				
Hebberts-burg	547	3990107	701707	0	0	float	Shale				
Hebberts-burg	548	3989446	702202	0	0	outcrop	Sandstone	Med-Coarse			
Hebberts-burg	549	3989382	702261	162	4	bedding inclined	Sandstone	Med-Coarse			
Hebberts-burg	550	3989176	702352	129	3	bedding inclined	Sandstone	Coarse			
Hebberts-burg	551	3989231	702723	351	3	bedding inclined	Sandstone	Med-Coarse			
Hebberts-burg	552	3989860	700181	0	0	outcrop	Sandstone	Med-Coarse			
Hebberts-burg	553	3989700	700332	42	5	bedding inclined	Shale				
Hebberts-burg	554	3989405	700661	43	16	bedding inclined	Sandstone	Med-Coarse			
Hebberts-burg	555	3989252	700769	129	11	bedding inclined	Sandstone	Med-Coarse			
Hebberts-burg	556	3988988	701045	121	4	bedding inclined	Sandstone	Med-Coarse			
Hebberts-burg	557	3987477	700533	106	11	bedding inclined	Sandstone	Med-Fine			
Hebberts-burg	558	3986755	700662	0	0						
Hebberts-burg	559	3986516	700528	0	0	outcrop	Sandstone	Med-Coarse			
Hebberts-burg	560	3986182	699491	0	0	outcrop	Sandstone	Medium			
Hebberts-burg	561	3999782	698254	0	0	bedding horizontal	Sandstone	Med-Coarse			
Hebberts-burg	562	3999579	698497	129	3	bedding inclined	Sandstone	Med-Coarse			
Hebberts-burg	563	3999449	698640	143	4	bedding inclined	Sandstone	Med-Coarse			
Hebberts-burg	564	3999115	698528	0	0	outcrop	Sandstone	Med-Coarse			
Hebberts-burg	565	3998809	698984	39	2	bedding inclined	Sandstone	Med-Fine			
Hebberts-burg	566	3998904	699125	0	0						
Hebberts-burg	567	3999244	699358	0	0	outcrop	Sandstone	Med-Coarse			
Hebberts-burg	568	3998754	698511	328	0	joint inclined	Sandstone	Med-Coarse			
Hebberts-burg	569	3998660	698504	46	4	bedding inclined	Sandstone	Med-Coarse			
Hebberts-burg	570	3995514	702380	0	0	outcrop	Shale	Fine			
Hebberts-burg	571	3995575	701777	211	5	bedding inclined	Sandstone	Med-Coarse			
Hebberts-burg	572	3995628	701667	71	10	bedding inclined	Sandstone	Med-Coarse			
Hebberts-burg	573	3997151	702066	251	8	bedding inclined	Shale				
Hebberts-burg	574	3999787	701305	0	0	bedding horizontal	Sandstone	Med-Coarse			
Hebberts-burg	575	3992082	701001	0	0	float	Sandstone	Med-Fine			

QUAD	STATION	UTM Northing	UTM Easting	STRIKE	INCLINE	TYPE	LITHOLOGY 1	GRAIN SIZE	LITHOLOGY 2	GRAIN SIZE 2	MODIFIER
Hebberts-burg	576	3991818	700948	0	0	float	Sandstone	Fine			
Hebberts-burg	577	3991842	700925	0	0	bedding horizontal	Sandstone	Fine			
Hebberts-burg	578	3991931	700894	231	14	bedding inclined	Sandstone	Fine			
Hebberts-burg	579	3991783	700779	0	0	float	Sandstone	Fine			
Hebberts-burg	580	3991518	700709	0	0	float	Sandstone	Fine	Si Cataclasite	Fine	
Hebberts-burg	581	3991735	700707	93	4	bedding inclined	Sandstone				
Hebberts-burg	582	3991698	700658	99	6	bedding inclined	Sandstone	Fine			
Hebberts-burg	583	3991612	700542	0	0	float	Conglomerate	Med-Fine			
Hebberts-burg	584	3991507	700208	0	0		Sandstone		Si Cataclasite		
Hebberts-burg	585	3991531	700145	0	0	float	Shale				
Hebberts-burg	586	3991637	699902	129	8	bedding inclined	Sandstone				
Hebberts-burg	587	3991858	699797	0	0	float	Conglomerate				
Hebberts-burg	588	3992050	699832	0	0	float	Sandstone		Shale		
Hebberts-burg	589	3992092	699862	268	4	bedding inclined	Sandstone	Fine			
Hebberts-burg	590	3993502	697318	0	0	float	Shale				
Hebberts-burg	591	3993168	697112	0	0	float	Sandstone	Med-Fine			
Hebberts-burg	592	3992829	697132	0	0	float	Sed Breccia	Fine			
Hebberts-burg	593	3992554	697128	0	0	float	Shale				
Hebberts-burg	594	3992454	697151	74	32	bedding inclined	Sandstone	Med-Coarse			
Hebberts-burg	595	3992553	696888	91	28	bedding inclined	Sandstone	Med-Fine			
Hebberts-burg	596	3992570	696929	0	0	outcrop	Sed Breccia	Med-Coarse			
Hebberts-burg	597	3992411	696985	0	0	outcrop	Sandstone	Med-Coarse			
Hebberts-burg	598	3992393	696939	68	31	bedding inclined	Sandstone	Med-Coarse			
Hebberts-burg	599	3992384	697250	84	16	bedding inclined	Sandstone	Med-Coarse			
Hebberts-burg	600	3992462	697218	49	21	bedding inclined	Sandstone	Med-Coarse			
Hebberts-burg	601	3992486	697308	58	24		Sandstone	Med-Coarse			
Hebberts-burg	602	3992975	697303	0	0	float	Sandstone	Fine			
Hebberts-burg	603	3996418	692241	0	0	bedding horizontal	Sandstone	Fine			
Hebberts-burg	604	3995275	692719	0	0	float	Sandstone	Med-Coarse			
Hebberts-burg	605	3995222	692705	0	0	bedding horizontal	Sandstone	Med-Coarse			
Hebberts-burg	606	3995200	692724	14	3	bedding inclined	Sandstone	Med-Coarse			
Hebberts-burg	607	3995933	694300	0	0	float	Sandstone				
Hebberts-burg	608	3995868	694340	87	6	bedding inclined	Sandstone	Med-Coarse			

QUAD	STATION	UTM Northing	UTM Easting	STRIKE	INCLINE	TYPE	LITHOLOGY 1	GRAIN SIZE	LITHOLOGY 2	GRAIN SIZE 2	MODIFIER
Hebberts-burg	609	3992369	700907	0	0	bedding horizontal	Sandstone	Med-Fine			
Hebberts-burg	610	3992565	700806	0	0	outcrop	Sandstone	Med-Fine			
Hebberts-burg	611	3994179	701558	37	9	bedding inclined	Sandstone	Med-Fine			
Hebberts-burg	612	3994306	701354	0	0	outcrop	Shale				
Hebberts-burg	613	3994497	701212	164	8	bedding inclined	Sandstone	Med-Coarse			
Hebberts-burg	614	3994547	701232	94	6	bedding inclined	Sandstone	Med-Coarse			
Hebberts-burg	615	3994596	701234	119	4	bedding inclined	Shale				
Hebberts-burg	616	3994607	701245	32	6	bedding inclined	Sandstone	Med-Coarse			
Hebberts-burg	617	3994654	701261	0	0	outcrop	Sandstone	Med-Coarse	Shale		
Hebberts-burg	618	3994771	701235	0	0	bedding horizontal	Shale	Fine			
Hebberts-burg	619	3989988	700236	206	6	bedding inclined					
Hebberts-burg	620	3990030	700210	0	0	outcrop					
Hebberts-burg	621	3990124	700256	151	5	bedding inclined					
Hebberts-burg	622	3990260	700366	96	8	bedding inclined					
Hebberts-burg	623	3990278	700409	139	12	bedding inclined					
Hebberts-burg	624	3990574	700457	166	6	bedding inclined					
Hebberts-burg	625	3990546	700533	270	72	bedding inclined					
Hebberts-burg	626	3990711	700693	21	18	bedding inclined					
Hebberts-burg	627	3990729	700702	76	26	bedding inclined					
Hebberts-burg	628	3990860	700651	77	16	bedding inclined					
Hebberts-burg	629	3990793	700763	56	32	bedding inclined					
Hebberts-burg	630	3990715	700869	0	0	float					
Hebberts-burg	631	3990787	700923	0	0	float					
Hebberts-burg	632	3996883	701335	49	11	bedding inclined					
Hebberts-burg	633	3996806	701187	0	0	float					
Hebberts-burg	634	3996758	701177	0	0	float	Sandstone		Shale		
Hebberts-burg	635	3996521	700819	0	0	float					
Hebberts-burg	636	3995613	699943	0	0	float					
Hebberts-burg	637	3995364	700017	0	0						
Hebberts-burg	638	3995301	700716	0	0	float					
Hebberts-burg	639	3995350	700775	0	0	float	Ss		Shale		
Hebberts-burg	640	3995607	700520	0	0	outcrop	Shale				
Hebberts-burg	641	3996210	700222	0	0	outcrop					

QUAD	STATION	UTM Northing	UTM Easting	STRIKE	INCLINE	TYPE	LITHOLOGY 1	GRAIN SIZE	LITHOLOGY 2	GRAIN SIZE 2	MODIFIER
Hebberts-burg	642	3998653	693341	0	0	float					
Hebberts-burg	643	3998611	693509	141	9	bedding inclined					
Hebberts-burg	644	3998966	692496	0	0	float					
Hebberts-burg	645	3998951	692470	0	0	float					
Hebberts-burg	1	3992572	158055	101	23	bedding inclined	Sandstone	Med-Fine			
Hebberts-burg	2	3992660	157993	0	0						X-Bedded
Hebberts-burg	3	3992660	157993	350	29	bedding inclined	Sandstone				
Hebberts-burg	4	3992801	157990	0	0						
Hebberts-burg	5	3992394	157893	0	0						
Hebberts-burg	6	3990506	701175	85	7	bedding inclined	Shale	Med-Fine			
Hebberts-burg	7	3990639	701218	0	0	outcrop	Shale				
Hebberts-burg	8	3989416	702215	0	0	outcrop	Sandstone				
Hebberts-burg	9	3989414	702215	125	25	bedding inclined	Sandstone				
Hebberts-burg	10	3989571	705094	295	8	bedding inclined	Shale				
Hebberts-burg	11	3989595	705372	295	8	bedding inclined	Shale				
Hebberts-burg	12	3989488	705471	0	0	float	Sandstone		Shale		
Hebberts-burg	13	3989731	705631	232	13	bedding inclined	Shale				
Hebberts-burg	14	3989666	705604	0	0	float	Sandstone				
Fox Creek	1	3992891	691069	0	0	float	Sandstone				
Fox Creek	2	3988842	691452	356	29	bedding inclined	Shale		Sandstone		
Fox Creek	3	3988831	691434	66	7	bedding inclined	Sandstone				
Fox Creek	4	3988890	691423	46	9	bedding inclined	Sandstone				
Fox Creek	5	3989178	691442	0	0	float	Sandstone				
Fox Creek	6	0	0	196	1	bedding inclined					
Fox Creek	7	0	0	0	0	outcrop					
Fox Creek	8	0	0	0	0	float					
Fox Creek	9	0	0	89	14	bedding inclined					
Fox Creek	10	0	0	0	0	bedding horizontal					
Fox Creek	11	0	0	84	1	bedding inclined					
Fox Creek	12	0	0	13	16	bedding inclined					
Fox Creek	13	0	0	76	3	bedding inclined					
Fox Creek	14	0	0	0	0	bedding horizontal					
Fox Creek	15	0	0	305	37	bedding inclined					
Fox Creek	16	0	0	77	21	bedding inclined					

QUAD	STATION	UTM Northing	UTM Easting	STRIKE	INCLINE	TYPE	LITHOLOGY 1	GRAIN SIZE	LITHOLOGY 2	GRAIN SIZE 2	MODIFIER
Fox Creek	17	0	0	61	47	bedding inclined					
Fox Creek	18	0	0	64	16	bedding inclined					
Fox Creek	19	0	0	49	14	bedding inclined					
Fox Creek	20	0	0	229	30	bedding inclined					
Fox Creek	21	0	0	59	35	bedding inclined					
Fox Creek	22	0	0	66	26	bedding inclined					
Fox Creek	23	0	0	143	18	bedding inclined					
Fox Creek	24	0	0	84	31	bedding inclined					
Fox Creek	25	0	0	0	0	outcrop					
Fox Creek	26	0	0	67	56	bedding inclined					
Fox Creek	27	0	0	0	0	outcrop					
Fox Creek	28	0	0	69	34	bedding inclined					
Fox Creek	29	0	0	89	45	bedding inclined					
Fox Creek	30	0	0	0	0						
Fox Creek	31	0	0	126	16	bedding inclined					
Fox Creek	32	0	0	0	0	outcrop					
Fox Creek	33	0	0	58	32	bedding inclined					
Fox Creek	34	0	0	0	0	outcrop					
Fox Creek	35	0	0	32	3	bedding inclined					
Fox Creek	36	0	0	270	4	bedding inclined					
Fox Creek	37	0	0	279	3	bedding inclined					
Fox Creek	38	0	0	0	0	outcrop					
Fox Creek	39	0	0	99	19	bedding inclined					
Fox Creek	40	0	0	38	3	bedding inclined					
Fox Creek	41	0	0	0	0	outcrop	Shale		Siltstone		
Fox Creek	42	0	0	39	4	bedding inclined	Ss				
Fox Creek	43	0	0	0	0	float					
Fox Creek	44	0	0	141	4	bedding inclined	Ss				
Fox Creek	45	0	0	64	10	bedding inclined	Shale				
Fox Creek	46	0	0	0	0	outcrop					
Fox Creek	47	0	0	189	3	bedding inclined	Ss				
Fox Creek	48	0	0	59	2	bedding inclined	Ss		Shale float		
Fox Creek	49	0	0	174	4	bedding inclined	Ss				
Fox Creek	50	0	0	102	19	bedding inclined	Ss				
Fox Creek	51	0	0	29	6	bedding inclined	Ss				
Fox Creek	52	0	0	96	5	bedding inclined					

QUAD	STATION	UTM Northing	UTM Easting	STRIKE	INCLINE	TYPE	LITHOLOGY 1	GRAIN SIZE	LITHOLOGY 2	GRAIN SIZE 2	MODIFIER
Fox Creek	53	0	0	0	0	float	Ss				
Fox Creek	54	0	0	0	0	float	Shale				
Fox Creek	55	0	0	191	7	bedding inclined	Ss				
Fox Creek	56	0	0	0	0	outcrop	Ss				
Fox Creek	57	0	0	216	17	bedding inclined	Ss				
Fox Creek	58	0	0	329	84	bedding inclined	Ss				
Fox Creek	59	0	0	0	0		Sa				
Fox Creek	60	0	0	268	21	bedding inclined	Ss				
Fox Creek	61	0	0	57	47	bedding inclined	Ss				
Fox Creek	62	0	0	234	60	bedding inclined					
Fox Creek	63	0	0	0	0	float	Ss				
Fox Creek	64	0	0	230	69	bedding inclined	Ss				
Fox Creek	65	0	0	21	90	bedding vertical	Ss				
Fox Creek	66	0	0	160	66	bedding inclined	Ss				
Fox Creek	67	0	0	0	0	float	Ss				
Fox Creek	68	0	0	0	0	float	Ss fine				
Fox Creek	69	0	0	0	0	float	Shale				
Fox Creek	70	0	0	0	0	float					
Fox Creek	71	0	0	0	0	bedding horizontal					
Fox Creek	72	0	0	38	4	bedding inclined	Ss				
Fox Creek	73	0	0	274	8	bedding inclined	Ss				
Fox Creek	74	0	0	76	4	bedding inclined	Ss				
Fox Creek	75	0	0	0	0	bedding horizontal	Ss				
Fox Creek	76	0	0	0	0	bedding horizontal	Ss				
Fox Creek	77	0	0	54	2	bedding inclined	Ss				
Fox Creek	78	0	0	221	3	bedding inclined	Ss				
Fox Creek	79	0	0	14	6	bedding inclined	Ss				
Fox Creek	80	0	0	313	3	bedding inclined	Ss				
Fox Creek	81	0	0	32	8	bedding inclined	Ss				
Fox Creek	82	0	0	44	12	bedding inclined	Ss				
Fox Creek	83	0	0	5	2	bedding inclined	Ss				
Fox Creek	84	0	0	259	3	bedding inclined	Ss				
Fox Creek	85	0	0	234	7	bedding inclined	Ss				
Fox Creek	86	0	0	274	3	bedding inclined	Ss				
Fox Creek	87	0	0	209	4	bedding inclined	Ss				
Fox Creek	88	0	0	231	1	bedding inclined	Ss				

QUAD	STATION	UTM Northing	UTM Easting	STRIKE	INCLINE	TYPE	LITHOLOGY 1	GRAIN SIZE	LITHOLOGY 2	GRAIN SIZE 2	MODIFIER
Fox Creek	89	0	0	284	12	bedding inclined	Ss				
Fox Creek	90	0	0	94	4	bedding inclined	Ss				
Fox Creek	91	0	0	171	2	bedding inclined	Ss				
Fox Creek	92	0	0	191	2	bedding inclined	Ss				
Fox Creek	93	0	0	202	11	bedding inclined	Ss				
Fox Creek	94	0	0	221	4	bedding inclined	Conglomerate				
Fox Creek	95	0	0	0	0	outcrop	Ss				
Fox Creek	96	0	0	36	9	bedding inclined	Cong				
Fox Creek	97	0	0	41	11	bedding inclined	Ss				
Fox Creek	98	0	0	244	7	bedding inclined	Cong				
Fox Creek	99	0	0	174	4	bedding inclined	Ss				
Fox Creek	100	0	0	82	5	bedding inclined	Ss				
Fox Creek	101	0	0	41	90	bedding vertical					
Fox Creek	102	0	0	0	0	outcrop	Ss	Fine			
Fox Creek	103	0	0	209	4	bedding inclined	Ss	Fine			
Fox Creek	104	0	0	20	28	bedding inclined					
Fox Creek	105	0	0	1	21	bedding inclined					
Fox Creek	106	0	0	38	18	bedding inclined	Ss	Fine			
Fox Creek	107	0	0	104	31	bedding inclined	Ss				
Fox Creek	108	0	0	49	23	bedding inclined	Ss				
Fox Creek	109	0	0	66	24	bedding inclined	Ss				
Fox Creek	110	0	0	24	7	bedding inclined	Ss				
Fox Creek	111	0	0	96	28	bedding inclined	Ss				
Fox Creek	112	0	0	29	49	bedding inclined	Ss				
Fox Creek	113	0	0	0	0	bedding horizontal	Ss				
Fox Creek	114	0	0	0	0	bedding horizontal	Conglomerate				
Fox Creek	115	0	0	0	0	bedding horizontal	Ss	Fine			
Fox Creek	116	0	0	0	0	bedding horizontal	Ss				
Fox Creek	117	0	0	0	0	bedding horizontal	Conglomerate				
Fox Creek	118	0	0	77	6	bedding inclined	Ss				
Fox Creek	119	0	0	296	50	bedding inclined	Conglomerate				
Fox Creek	120	0	0	0	0	outcrop					
Fox Creek	121	0	0	245	66	bedding inclined					
Fox Creek	122	0	0	76	16	bedding inclined					

QUAD	STATION	UTM Northing	UTM Easting	STRIKE	INCLINE	TYPE	LITHOLOGY 1	GRAIN SIZE	LITHOLOGY 2	GRAIN SIZE 2	MODIFIER
Fox Creek	123	0	0	216	17	bedding inclined	Ss				
Fox Creek	124	0	0	226	4	bedding inclined	Ss				
Fox Creek	125	0	0	84	19	bedding inclined	Ss				
Fox Creek	126	0	0	204	14	bedding inclined	Ss				
Fox Creek	127	0	0	29	3	bedding inclined	Ss				
Fox Creek	128	0	0	163	0	bedding inclined					
Fox Creek	129	0	0	232	32	bedding inclined	Ss	Fine			
Fox Creek	130	0	0	86	21	bedding inclined	Sa				
Fox Creek	131	0	0	104	3	bedding inclined	Ss				
Fox Creek	132	0	0	79	6	bedding inclined	Ss				
Fox Creek	133	0	0	336	1	bedding inclined	Ss	Fine			
Fox Creek	134	0	0	0	0	bedding horizontal	Ss				
Fox Creek	135	0	0	286	2	bedding inclined	Ss				
Fox Creek	136	0	0	176	4	bedding inclined	Ss				
Fox Creek	137	0	0	176	11	bedding inclined	Ss				
Fox Creek	138	0	0	171	1	bedding inclined	Ss				
Fox Creek	139	0	0	0	0	outcrop	Ss				
Fox Creek	141	0	0	96	3	bedding inclined	Ss				
Fox Creek	140	0	0	71	1	bedding inclined	Ss				
Fox Creek	142	0	0	89	2	bedding inclined	Ss				
Fox Creek	143	0	0	164	2	bedding inclined	Ss				
Fox Creek	144	0	0	0	0	outcrop	Shale				
Fox Creek	145	0	0	0	0	outcrop	Ss				
Fox Creek	146	0	0	95	2	bedding inclined					
Fox Creek	147	0	0	297	90	bedding vertical	Ss				
Fox Creek	148	0	0	64	21	bedding inclined	Ss				
Fox Creek	149	0	0	11	48	bedding inclined	Ss				
Fox Creek	150	0	0	0	0	float	Cataclasite				
Fox Creek	151	0	0	64	19	bedding inclined					
Fox Creek	152	0	0	51	53	bedding inclined					
Fox Creek	153	0	0	49	19	bedding inclined					
Fox Creek	154	0	0	178	6	bedding inclined					
Fox Creek	155	0	0	0	0	outcrop	Shale				
Fox Creek	156	0	0	154	24	bedding inclined					
Fox Creek	158	0	0	26	4	bedding inclined					

QUAD	STATION	UTM Northing	UTM Easting	STRIKE	INCLINE	TYPE	LITHOLOGY 1	GRAIN SIZE	LITHOLOGY 2	GRAIN SIZE 2	MODIFIER
Fox Creek	159	0	0	0	0	bedding horizontal					
Fox Creek	160	0	0	62	36	bedding inclined					
Fox Creek	161	0	0	221	39	bedding inclined	Ss				
Fox Creek	162	0	0	22	7	bedding inclined	Ss				
Fox Creek	163	0	0	0	0	outcrop					
Fox Creek	164	0	0	24	0	joint	Ss				
Fox Creek	165	0	0	14	43	bedding inclined					
Fox Creek	166	0	0	295	90	bedding vertical	Ss				
Fox Creek	167	0	0	4	37	bedding inclined	Ss		Shale		
Fox Creek	168	0	0	122	7	bedding inclined	Ss	Fine			
Fox Creek	169	0	0	218	24	bedding inclined					
Fox Creek	170	0	0	0	0	float	Ss				
Fox Creek	171	0	0	94	6	bedding inclined					
Fox Creek	172	0	0	52	3	bedding inclined	Ss				
Fox Creek	173	0	0	167	35	bedding inclined	Ss				
Fox Creek	174	0	0	168	22	bedding inclined	Ss				
Fox Creek	175	0	0	0	0	float	Ss	Fine			
Fox Creek	176	0	0	161	80	bedding inclined					
Fox Creek	177	0	0	183	2	bedding inclined	Ss				
Fox Creek	178	0	0	172	3	bedding inclined					
Fox Creek	179	0	0	13	4	bedding inclined					
Fox Creek	180	0	0	0	0	float	Shale				
Fox Creek	181	0	0	154	7	bedding inclined					
Fox Creek	182	0	0	24	2	bedding inclined					
Fox Creek	183	0	0	34	4	bedding inclined					
Fox Creek	184	0	0	290	2	bedding inclined					
Fox Creek	185	0	0	0	0	bedding horizontal					
Fox Creek	186	0	0	146	3	bedding inclined	Ss	Fine			
Fox Creek	187	0	0	181	3	bedding inclined	Conglomerate				
Fox Creek	188	0	0	0	0	float	Shale		Siltstone		
Fox Creek	189	0	0	0	0	outcrop	Conglomerate				
Fox Creek	190	0	0	96	3	bedding inclined	Conglomerate				
Fox Creek	191	0	0	0	0	bedding inclined	Ss		Shale		
Fox Creek	192	0	0	0	0	bedding inclined	Shale				
Fox Creek	193	0	0	0	0	float	Conglomerate				
Fox Creek	194	0	0	0	0	bedding inclined					

QUAD	STATION	UTM Northing	UTM Easting	STRIKE	INCLINE	TYPE	LITHOLOGY 1	GRAIN SIZE	LITHOLOGY 2	GRAIN SIZE 2	MODIFIER
Fox Creek	195	0	0	16	4	bedding inclined	Ss	Fine-med.			
Fox Creek	196	0	0	172	3	bedding inclined	Ss				
Fox Creek	197	0	0	0	0	bedding horizontal	Ss				
Fox Creek	198	0	0	76	11	bedding inclined					
Fox Creek	199	0	0	253	5	bedding inclined					
Fox Creek	200	0	0	36	6	bedding inclined					
Fox Creek	201	0	0	146	12	outcrop					
Fox Creek	202	0	0	49	8	bedding inclined	Ss				
Fox Creek	203	0	0	106	10	bedding inclined					
Fox Creek	204	0	0	0	0	bedding horizontal					
Fox Creek	205	0	0	96	6	bedding inclined					
Fox Creek	206	0	0	0	0	bedding horizontal	Ss				
Fox Creek	207	0	0	42	5	bedding inclined					
Fox Creek	208	0	0	104	31	bedding inclined					
Fox Creek	209	0	0	154	12	bedding inclined					
Fox Creek	210	0	0	134	15	bedding inclined					
Fox Creek	211	0	0	124	1	bedding inclined					
Fox Creek	212	0	0	129	1	bedding inclined					
Fox Creek	213	0	0	59	4	bedding inclined					
Fox Creek	214	0	0	0	0	bedding horizontal	Ss		Shale		
Fox Creek	215	0	0	252	15	bedding inclined					
Fox Creek	216	0	0	57	3	bedding inclined					
Fox Creek	217	0	0	0	0	bedding horizontal					
Fox Creek	218	0	0	201	9	bedding inclined					
Fox Creek	219	0	0	0	0	float	Ss				
Fox Creek	220	0	0	18	7	bedding inclined					
Fox Creek	221	0	0	248	3	bedding inclined					
Fox Creek	222	0	0	0	0	outcrop					
Fox Creek	223	0	0	0	0	bedding horizontal					

VITA

Paul Levader "Vade" Scruggs was born in Lakeland, Florida in 1990 to Del and Marte Scruggs. Vade moved to Tennessee at the age of six and lived in Knoxville for three years before the family moved to Lancing, Tennessee, near the Obed Wild and Scenic River. He graduated from Wartburg Central High School in May 2008 and enrolled in the alma mater of both of his parents— the University of Tennessee Knoxville— in August 2008. He originally planned to work in the medical field, but changed his major to geology in 2010 after discovering a passion for earth science. In his first year in the geology department, he won the "Jimmy Walls Award" for outstanding work in an introductory geology class. In December 2012, he graduated with a Bachelor of Science degree in geology, and he began working on his Master of Science degree in geology in January 2013, under Dr. Robert Hatcher, Jr. In August 2013 he received the Miller Energy Fellowship to pursue a thesis project pertaining to subsurface reefs in the Cumberland Plateau of Tennessee. The following year he received a grant from the National Park Service to map the surface geology of three quadrangles on the Cumberland Plateau. The study area for both of these research projects include his parents' home where he originally developed his appreciation for the great outdoors.